AUSTRALIAN EMERGENCY MANUALS SERIES

PART III

Emergency Management Practice

Volume 1—Service Provision

Manual 2

DISASTER MEDICINE

Health and Medical Aspects of Disasters

Second Edition

EMERGENCY MANAGEMENT AUSTRALIA

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INFORMATION ON THE AUSTRALIAN EMERGENCY MANUALS SERIES

The first publication in the original AEM Series of mainly skills reference manuals was produced in 1989. In August 1996, on advice from the National Emergency Management Principles and Practice Advisory Group, EMA agreed to expand the AEM Series to include a more comprehensive range of emergency management principles and practice reference publications. The Series is now structured in five parts as set out below.

Parts I to III are issued as bound booklets to State and Territory emergency management organisations and appropriate government departments for further dissemination to approved users including local government. Parts IV and V (skills and training management topics) are issued in loose-leaf (amendable) form to all relevant State agencies through each State and Territory Emergency Service who maintain State distribution/amendment registers. All private and commercial enquiries are referred to EMA as noted at the end of the Foreword on page vii.

AUSTRALIAN EMERGENCY MANUALS SERIES STRUCTURE AND CONTENT

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PART V —THE MANAGEMENT OF TRAINING

Manual 1	Small Group Training Management (2nd edn)	A
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Key to status: A = Available; A/R = original version Available/under Review; D = under Development; P= Planned; R = under Review/Revision; U/R = Unavailable/under Review

FOREWORD

The purpose of this Manual is to provide a basic reference for **health** and **medical** professionals in **disaster medicine**. It is intended for use in education, training and planning by all health personnel.

In this context, the terminology 'health and medical personnel' is used to include personnel providing first aid, ambulance, medical doctor, nursing, mental health, public health, scientific and other associated expertise and involvement.

This Manual has been reviewed by a national consultative committee (NCC), representative of health professionals, learned bodies, States and Territories, and selected Commonwealth organisations.

The NCC was initiated by the Australian Medical Disaster Coordination Group (AMDCG) of the Australian Health Ministers' Advisory Council and is sponsored by Emergency Management Australia, Department of Defence.

Obviously situations change and new policy procedure is regularly being developed. Thus, the Manual will be revised and updated by a NCC every four years.

Proposed changes to the document should be forwarded to the Director General, Emergency Management Australia, at the address shown below, through the relevant State/Territory emergency management organisation.

Duplication may occur in some areas, with the aim of permitting the user to gain the desired information from individual or multiple chapter references without having to scan the entire Manual. It is isued in bound and loose-leaf formats to meet the varying needs of users.

The use of trade names in this Manual is not intended to be restrictive, preferential or promotional, rather, trade names are used where descriptive clarity is required.

This publication is provided free of charge to approved Australian organisations which may obtain copies from the Counter Disaster Officer/Unit located in each State/Territory health department. A contact address appears at the back of the Manual. Limited free copies for relevant (non-health) emergency management agencies are issued through each State/Territory emergency management organisation.

Manuals may be supplied to other Australian or overseas requesters upon payment of cost recovery charges. Consideration is given to requests from developing countries for copies without charges.

Overseas enquiries (for free copies) and all those regarding purchase of this Manual should be sent to the Director-General, Emergency Management Australia, PO Box 1020, DICKSON ACT 2602, AUSTRALIA, (facsimile +61 (0)2 6257 7665, Email: EMA@ema.gov.au).

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PREFACE

In recent times much attention has been focused on generic emergency management. This document concentrates on the important aspects of the preservation of life, the effective management of the injured, and the restoration of the general health and well-being of the affected community.

Some years ago sections of the health profession approached the Federal Government for assistance with the training of medical practitioners, particularly in rural and remote areas, to handle mass casualty situations, where resources are often overwhelmed.

Following discussion between Emergency Management Australia and the then Commonwealth Department of Health and Family Services, a special working party was set up to look at a number of options to improve the nation's health and medical capability, to assist in such circumstances. The Working Party comprised of selected experts from States and Territories and the Commonwealth, and a wide range of relevant professions.

The original Working Party decided to develop a series of training aids, to be known as the Australian Disaster Medical Training Package, which were widely disseminated free of charge, to appropriate organisations throughout the nation, to facilitate education and training in disaster medicine.

Two video tapes were made—'You Can Make A Difference' which was directed specifically at the medical professions and 'Disasters are Different' especially produced about Australian disasters and major incidents.

The key component within the Package was the development of this **Australian Emergency Manual—Disaster Medicine**. This first edition became available in March 1995.

The Manual attracted a quite unexpected level of interest and use. Disseminated widely, it also received wide national and international acclaim from the World Health Organization, and a number of comparable developed nations.

This new edition reflects developments and innovations over the intervening years, including risk management and assessment. Also new initiatives such as mass gathering medicine aspects; chemical, biological and radiation situations; and epidemiology and research, have been added. The experiences arising from the Port Arthur Massacre and the Thredbo Landslide have been incorporated.

Many contributors Australia-wide should be thanked for their time and input with the development of the Manual. A final Draft was circulated to over 150 organisations and selected individuals with a three month comment period.

The Manual is the core component of the National Disaster Medicine Training Course, held annually at EMA's Australian Emergency Management Institute, and the derived portable Australian Disaster Medicine Course, for use across the country.

These initiatives are conducted under the Australian Medical Disaster Coordination Group (AMDCG) of the Australian Health Ministers' Advisory Council.

The AMDCG comprises representatives from All States and Territories and the Commonwealth including the Department of Defence, the Department of Health and Aged Care and Emergency Management Australia.

I commend the 1999 Edition of this Manual to all health professionals and emergency managers.

Comments should be addressed to: The Secretary, AMDCG, c/- Counter Disaster Unit, MDP 27, Department of Health and Aged Care, GPO Box 9848, Canberra ACT 2601, Australia.

(Dr) DIANA HORVATH
CHAIR
AUSTRALIAN MEDICAL DISASTER COORDINATION GROUP
MAY 1999

INTRODUCTION

AIM

The aim of this publication is to provide a basic reference for health and medical professionals in disaster medicine.

DEFINITION

Disaster medicine is the prevention, reduction and mitigation of the effects of disasters on the health of communities; the provision of appropriate treatment for those affected; and the restoration of health services and facilities to the pre-disaster situation as soon as possible.

The provision of health and medical care in response to any disaster often involves mass casualty management. It includes rescue, first aid, casualty clearing, emergency surgical procedures, hospital treatment, mental health and environmental health measures.

Disaster medicine requires a different approach than that for emergency medicine and normal public health management practices, because of the overwhelming nature of the event and the associated disorder.

CHAPTER 1

OVERVIEW

INTRODUCTION

1. The Manual provides guidance on managing health aspects of disasters. It is divided into four sections, each containing a number of chapters, as well as some supporting appendices.

DISASTER MANAGEMENT AND PLANNING

2. This Section includes general disaster management concepts and arrangements, as well as planning concepts and processes. The management of health effects of disasters must be integrated with other elements of emergency management. Of particular importance is the requirement to address all phases of the disaster management process (prevention, preparedness, response and recovery), as well as to incorporate a total health response, including:

- ambulance;
- acute medical care;
- first aid;
- public health; and
- mental health.

3. Planning concepts and processes include the need to examine hazards, from the health perspective, for their likely health implications, including the use of disaster epidemiology.

DISASTER MEDICINE PRACTICE

4. This Section incorporates specific arrangements involved in managing health aspects of disasters. This includes public health, site response, triage, clinical management, transport, hospitals and mental health. The manual does not include specific clinical management of diseases and injuries, as adequate texts already exist in these areas.

DISASTER MEDICINE RESOURCES

5. This Section looks at specific health resources involved in managing disasters. These range from individual equipment used by medical teams, up to resources at a community, State or Commonwealth level.

DISASTER MEDICINE—OTHER CONSIDERATIONS

6. This Section considers a number of areas which, although they may not fall specifically in the health arrangements, can impact significantly on the health response to a disaster. These include mass gatherings, the management of the deceased, cultural considerations, handling the media, and legal and financial considerations.

7. Disasters of all types are notable in their ability to not only damage property, but also to cause pain and suffering on a massive scale. To effectively manage such events from a health perspective requires not only the clinical skill from an individual perspective, but also to appreciate the 'big picture' from a true **population** health perspective.

CHAPTER 2

EMERGENCIES AND DISASTERS: KEY MANAGEMENT CONCEPTS AND ARRANGEMENTS

INTRODUCTION

1. The purpose of this chapter is to describe Australia's emergency and disaster arrangements and the concepts on which they are based.

EMERGENCIES AND DISASTERS

Definitions

2. In disaster management in Australia the terms emergency and disaster are often used interchangeably. The Australian Emergency Management Glossary offers the following definitions:

- ***Emergency—***An event, actual or imminent, which endangers or threatens to endanger life, property or the environment, and which requires a significant and coordinated response.

- ***Disaster—***A serious disruption to community life which threatens or causes death or injury in that community, and damage to property which is beyond the day-to-day capacity of the prescribed statutory authorities and which requires special mobilisation and organisation of resources other than those normally available to those authorities.

3. This manual covers the requirements for managing health aspects of major risks to the well being of the community. These risks have the potential to overwhelm community and organisational arrangements, and may require extraordinary responses to be instituted.

Hazards

4. Emergencies and disasters occur when a hazard impacts upon a community which is vulnerable to that hazard. The magnitude of the event varies according to the characteristics of the hazard (such as type and the intensity), vulnerability characteristics of the community (such as levels of prevention, demographic profile and preparedness) and their interaction.

5. Emergencies and disasters are usually described by the hazards associated with them. Australian communities live with a variety of natural and technological hazards. Natural hazards include all those of climatic, geophysical or biological origin, while technological hazards include those arising from nuclear/biological/chemical technology, human fault and hostile action.

6. The presence of some major natural hazards, such as cyclones and bushfires depends on the season and geographic region, but other types of hazards,

particularly those made by humans, are less predictable, and could impact almost anywhere.

IMPACT OF DISASTERS ON AUSTRALIA

7. Australia has experienced a wide range of disasters which have resulted in multiple deaths, injuries and psychological trauma and significant social, economic and environmental losses. These losses can be reduced by effective disaster prevention, preparedness, response and recovery strategies.

8. On average, natural disasters (excluding drought) affect over 500,000 Australians every year. In the past 25 years, Australia has experienced, on average, a major disaster about once every four years. These have included Cyclone Tracy, Ash Wednesday Bushfires, Newcastle Earthquake, 1994 NSW Bushfires, Sydney severe storms including hailstorms (1990, 1991 and 1999), Thredbo Landslide, Cyclone Vance (Exmouth) and major flooding around Brisbane (1974), Nyngan and Charleville (1990), Adelaide (1992), Benalla (1993) and Townsville and Katherine (1998). Smaller disasters and emergencies have occurred more frequently. Additionally, Australia has experienced many major non-natural disasters such as the collapse of the Westgate and Tasman Bridges, the Granville train crash, the Coode Island fires, the Port Arthur Massacre, interruption to gas supplies in Victoria, and several costly oil spills.

9. Tangible losses (ie those that can be expressed in dollar terms) include damages to buildings and contents, to commerce and industry, to infrastructure, and to homes, other property and jobs. Total average annual losses from natural disasters (excluding drought) are estimated to exceed $1.25 billion. The intangible losses include injury and death and personal distress. In the last 25 years, natural disasters have caused over 500 deaths and 6000 injuries in Australia. Disasters have in some way affected, over 12.5 million people, in aggregate, over this period.

10. The consequential impacts of these events are that businesses collapse, jobs are lost, tourism suffers, insurance premiums rise, and local, regional and national economies suffer.

11. Most communities are unable to meet the costs of disasters. With costs escalating, the capacity of communities to cope is even more likely to be overwhelmed by disasters. Disasters of substantial magnitude are not limited to local or regional impacts. The whole country is affected and provides assistance and support to those directly impacted.

EMERGENCY MANAGEMENT CONCEPTS

12. Australian emergency and disaster management arrangements are based on four well-established concepts:

- The All Agencies (or Integrated) Approach
- The Comprehensive Approach

- The All Hazards Approach
- The Prepared Community

13. Emergency Risk Management is a relatively new concept which is readily gaining acceptance among the Australian disaster management community.

The All Agencies (or Integrated) Approach

14. Arrangements for dealing with disasters involve active partnerships among Commonwealth, State and Territory and local levels of government, statutory authorities, private, voluntary and community organisations, and individuals. The All Agencies Approach ensures that all the agencies likely to be involved in any disaster or emergency work together smoothly in the implementation of emergency management arrangements.

The Comprehensive Approach

15. The comprehensive approach to disaster management embraces strategies in prevention, preparedness, response and recovery (PPRR). PPRR are aspects of disaster management, not sequential phases.

- ***Prevention—***Regulatory and physical measures to ensure that emergencies are prevented, or their effects mitigated.
- ***Preparedness—***Arrangements to ensure that, should a disaster occur, all those resources and services which may be needed to cope with the effects, can be rapidly mobilised and deployed.
- ***Response—***Actions taken in anticipation of, during and immediately after impact to ensure that its effects are minimised and that people are given immediate relief and support.
- ***Recovery—***The coordinated process of supporting disaster-affected communities in reconstructing their physical infrastructure and restoration of emotional, social, economic and physical well-being.

All Hazards Approach

16. Different types of hazards can cause similar problems for a community. Therefore it is desirable to establish a single set of management arrangements capable of encompassing all hazards. The All Hazards Approach requires the identification of all hazards likely to be faced by a community followed by the application of simple arrangements which, to the maximum extent possible, cater for all events. Many hazards, however, will also require specific prevention, preparedness, response and recovery measures.

The Prepared Community

17. Australia's disaster management arrangements focus on preparing communities for emergencies and disasters. A prepared community is one

which has developed effective emergency and disaster management arrangements at the local level, resulting in:

- an alert, informed and active community which supports its voluntary organisations;
- an active and involved local government; and
- agreed and coordinated arrangement for prevention, preparedness, response and recovery.

Emergency Risk Management

18. The release of the Australian/New Zealand Standard on Risk Management (AS/NZS 4360:1995) has prompted emergency managers to examine the application of the risk management approach to the management of risks to communities. The Standard defines risk management as 'the systematic application of management policies, procedures and practices to the tasks of identifying, analysing, evaluating, treating and monitoring risk.' (AS/NZS 4360) In the emergency risk management context, hazards can be considered sources of risk, the community as the element at risk, and risk as the interactions between them and the environment. Hence, emergency management can be defined as the range of measures to manage the risks between the community and its environment. Emergency risk management will assist communities to minimise their risk through the preparation of comprehensive plans of prevention, preparedness, response and recovery strategies.

COMMAND, CONTROL AND COORDINATION

19. Emergency management structures and plans prescribe the command, control and coordination arrangements to apply during multi-service operations. These arrangements are as follows:

- ***Command*—**The direction of members and resources of an organisation in the performance of the organisation's role and tasks. Authority to command is established in legislation or by agreement with an organisation. Command relates to organisation and operates vertically within an organisation.
- ***Control*—**The overall direction of emergency management activities in an emergency situation. Authority for control is established in legislation or in an emergency plan, and carries with it the responsibility for tasking and coordinating other organisations in accordance with the needs of the situation. Control relates to situations and operates horizontally across organisations.
- ***Coordination*—**The bringing together of organisations and elements to ensure an effective response, primarily concerned with systematic acquisition and application of resources (organisation, personnel, and equipment) in accordance with the requirements imposed by the threat or impact of an emergency. Coordination relates primarily to resources, and

operates, vertically within an organisation, as a function of the authority to command, and horizontally, across organisations, as a function of the authority to control.

EMERGENCY AND DISASTER MANAGEMENT ARRANGEMENTS

20. In broad terms, emergency management is a range of measures to manage risks to communities and the environment. More specifically, emergency management is the organisation and management of resources for dealing with all aspects of emergencies and disasters. It involves the plans, structures and arrangements which are established to bring together the normal endeavours of government, voluntary and private agencies in a comprehensive and coordinated way to deal with the whole spectrum of emergency needs including prevention, preparedness response and recovery.

Integral Elements

21. The following elements are considered integral parts of emergency and disaster management:

- An alert, informed and prepared community.
- The identification and assessment of the risks that the community faces.
- A program for prevention and mitigation of emergencies and disasters.
- Identification of those responsible for all aspects of comprehensive emergency management and planning for prevention, response and recovery.
- Acceptance of support roles and responsibilities.
- Identification of those responsible for controlling and coordinating emergency operations.
- Cooperation between emergency services and others, and acceptance of their roles in emergency management.
- A coordinated approach to the use of all resources, arrangements to enable communities to recover from emergencies and disasters.

KEY EMERGENCY MANAGEMENT AUTHORITIES

National

22. The peak national emergency management policy body is the National Emergency Management Committee (NEMC) chaired by the Director General, Emergency Management Australia, and comprising the Chairpersons and Executive Officers of the peak State or Territory emergency management organisations and representatives from other appropriate peak Commonwealth and national bodies.

Commonwealth

23. The role of the Commonwealth Government is essentially to assist States and Territories with developing their emergency management capabilities. Emergency Management Australia (EMA) is responsible for the day-to-day management of this Commonwealth function. EMA coordinates Commonwealth Government physical disaster assistance to States and Territories, and to overseas countries on behalf of the Australian Agency for International Development (AusAID). The Commonwealth also provides financial assistance through the Natural Disaster Relief Arrangements which are administered by the Department of Finance and Administration.

State and Territory

24. States and Territories have primary responsibility for the protection and preservation of the lives and property of their citizens through:

- legislative and regulatory arrangements within which the community and various agencies operate;
- provision of police, fire, ambulance, emergency services, and health services; and
- government and statutory agencies which provide services to the community.

PRINCIPLE

Under the Commonwealth of Australia Constitution Act the management of disasters or a major incident is a State/Territory responsibility.

25. Each State or Territory has established a peak emergency management organisation, comprising senior members of appropriate Government agencies and other organisations, to consider emergency and disaster management matters. While the names and functions of these committees vary from State to State, they are responsible for ensuring that plans and arrangements are in place for dealing with emergencies and disasters.

Local Government

26. Local governments play a major role in the emergency management partnership by providing a variety of services such as public works, health, welfare and other functions which are required on a daily basis, and particularly when the community is affected by emergencies and disasters. While arrangements differ between States and Territories, committees at district/regional and/or local levels are responsible for aspects of emergency management within their jurisdiction.

Other Organisations and Individuals

27. Many private sector, voluntary and community organisations, professional disciplines and individuals also contribute to planning and management of emergencies and disasters, and play significant roles in prevention, preparedness, response and recovery.

DISASTER MEDICINE AND HEALTH POLICY-MAKING

28. The Australian Medical Disaster Coordination Group (AMDCG) is the peak body for the development of national policy on disaster medicine. The AMDCG reports to the Australian Health Ministers' Advisory Council (AHMAC) and comprises representatives from the State and Territory health authorities, the Commonwealth Department of Health and Aged Care, Emergency Management Australia and the Department of Defence.

29. At the Commonwealth level primary responsibility for disaster medicine and health policy resides with the Department of Health and Aged Care, and with respective health and ambulance authorities at the State and Territory level. Policy is implemented by all levels of Government—Commonwealth, State/Territory and Local.

EMERGENCY MANAGEMENT OPERATIONAL AGENCIES

Commonwealth

30. During disasters, EMA coordinates the provision of Commonwealth physical assistance to States and Territories from the National Emergency Management Coordination Centre (NEMCC) at EMA's Canberra Office. Through a network of Emergency Management Liaison Officers (EMLOs), the NEMCC has call on Commonwealth resources and such commercial assistance as may be deemed necessary. Assistance coordinated by EMA is usually provided at no cost to States or Territories.

Commonwealth Assistance

31. There is an established procedure for requesting assistance from the Commonwealth. All States and Territories have a nominated officer or officers who are authorised to request Commonwealth assistance in the event that State/Territory or commercial resources cannot meet the requirement. Nominated officers are as follows:

- Qld—Executive Officer, Central Control Group, State Counter Disaster Organisation

- NSW—State Emergency Operations Controller
- ACT—Executive Officer, ACT Emergency Management Committee
- Vic—State Emergency Response Coordinator
- Tas—Executive Officer, State Disaster Committee and Executive
- SA—State Coordinator, State Disaster Committee
- WA—State Emergency Coordinator
- NT—Executive Officer, Counter Disaster Council

All State and Territory requests for assistance must only be made via the nominated officer.

32. Personnel who are involved in developing a request for assistance from the Commonwealth must:

- provide a brief description of the requested resources, the need and associated tasks;
- provide a reason for the request and reasons why the requirement cannot be met from within State/Territory resources (government, commercial or other);
- the request must be couched in the form of the problem. Do not specify the solution other than in very general terms;
- when transport is required, identify weight and dimensions and any special storage/handling requirements;
- nominate the personnel skills required, not the individuals;
- in the case of personnel and equipment, indicate the duration of the requirement;
- provide details of when and where the resources are required;
- provide full details of the delivery point, contact officer/s at both the State level and the receiving area, plus telephone and facsimile numbers (where available); and
- provide any general comments that may contribute to the most timely and effective response to the request.

33. This procedure does not preclude liaison between agencies during disasters, but the established State/Territory/Commonwealth operational agencies should be kept fully informed.

State and Territory

34. Each State and Territory has an operational authority responsible for the activation of appropriate disaster plans and a State Emergency Operations Centre (or equivalent) capable of command/control/coordination of all resources required to deal with the disaster at the State/Territory level.

35. The health authority in each State/Territory is responsible for coordinating the health function. The authority may task, activate and/or finance Government, private and non-Government Agencies to provide health services.

36. Health personnel should check with the relevant authorities for advice on State/Territory and local administrative and management arrangements.

SUMMARY

37. An understanding of the Australian emergency management framework and its associated concepts is important in helping to place the management of the health effects of disasters in context.

38. Australian emergency and disaster management arrangements are based on the following concepts:

- The All Agencies (or Integrated) Approach
- The Comprehensive Approach
- The All Hazards Approach
- The Prepared Community

39. Emergency Risk Management is a relatively new concept also gaining acceptance among the Australian disaster management community.

40. There are established arrangements incorporating Commonwealth, State/Territory and local government to provide a coordinated response to disasters within Australia.

REFERENCES

41. References used in this Chapter are as follows:

- Emergency Management Australia: **Australian Counter-Disaster Handbook—Volume 1: Commonwealth Counter-Disaster Concepts and Principles,** Second Edition 1993.
- Emergency Management Australia: **Australian Counter-Disaster Handbook—Volume 2: Australian Emergency Management Arrangements,** Fifth Edition 1996.
- Emergency Management Australia: **Australian Emergency Manuals Series, Part I Manual 3—Australian Emergency Management Glossary,** 1998.
- Natural Disasters Organisation: **Australian Emergency Manual—Community Emergency Planning Guide,** Second Edition 1992.

- Standards Australia: **Australian/New Zealand Standard (AS/NZS 4360:1995) Risk Management,** Standards Australia, New South Wales, 1995.
- EMA Website: **http://www.ema.gov.au**

CHAPTER 3

PLANNING

INTRODUCTION

1. The purpose of this chapter is to provide advice on key points in the development of comprehensive and integrated plans for managing health effects of disasters.

WHY PLAN?

2. The economic and social effects of major emergencies and disasters include destruction of property, dislocation of communities, loss of life, numerous injuries and years of mental trauma.

3. Coping with hazards gives us a reason and focus for planning. If hazards, natural or technological did not threaten, there would be no reason to plan, as normal daily health and medical arrangements within communities in particular, are usually sufficient to cope with the day to day issues. All communities face hazards of different types and severity. Planning processes will reveal hazards, identify vulnerable aspects of the community and determine strategies to enable communities to manage the risks associated with the interaction of hazards and vulnerabilities.

PLANNING MANAGEMENT AND RESPONSIBILITIES

4. An agreed management structure should apply to all aspects (incorporating prevention, preparedness, response and recovery) at all levels of emergency management planning (Commonwealth, State/Territory, district/region, local, organisation, community).

5. Representative planning committees are essential to emergency planning to ensure that all aspects of managing disasters are covered in the planning process and to gain the commitment of key people and organisations. Emergency management planning committees need to determine which specialist functions are necessary for effective management of emergency and disaster risks. These functions may include public safety, health, communications, rescue, welfare (which usually includes catering, clothing, housing and personal support services), transport, engineering and agriculture.

6. It may be necessary to form functional planning sub-committees responsible to the main planning committee to prepare and maintain supporting plans covering essential functions. Functional sub-committees are usually established at State, district and (where practicable) local levels. A representative of each functional sub-committee should be a member of the main planning committee.

HIERARCHY OF PLANS

7. A critical concept in emergency management, particularly in response and recovery planning, is the control of escalating operations. Initial operational activity is at the local level. More resources may be called in gradually from the regional, state or national level, as required, to supplement resources at the lower levels.

8. Therefore, compatibility between plans at the different levels is required. A hierarchy of emergency management plans exists whereby plans at lower levels dovetail into plans at the next highest level. Command and control arrangements, as well as the roles and responsibilities described in a plan, must be compatible with other plans to which it relates.

EMERGENCY AND DISASTER PLANNING

9. Emergency planning refers to the analytical and consultative process which enables governments, organisations and communities to manage risks from the various hazards which they face. Emergency management arrangements and related strategies should flow from this process.

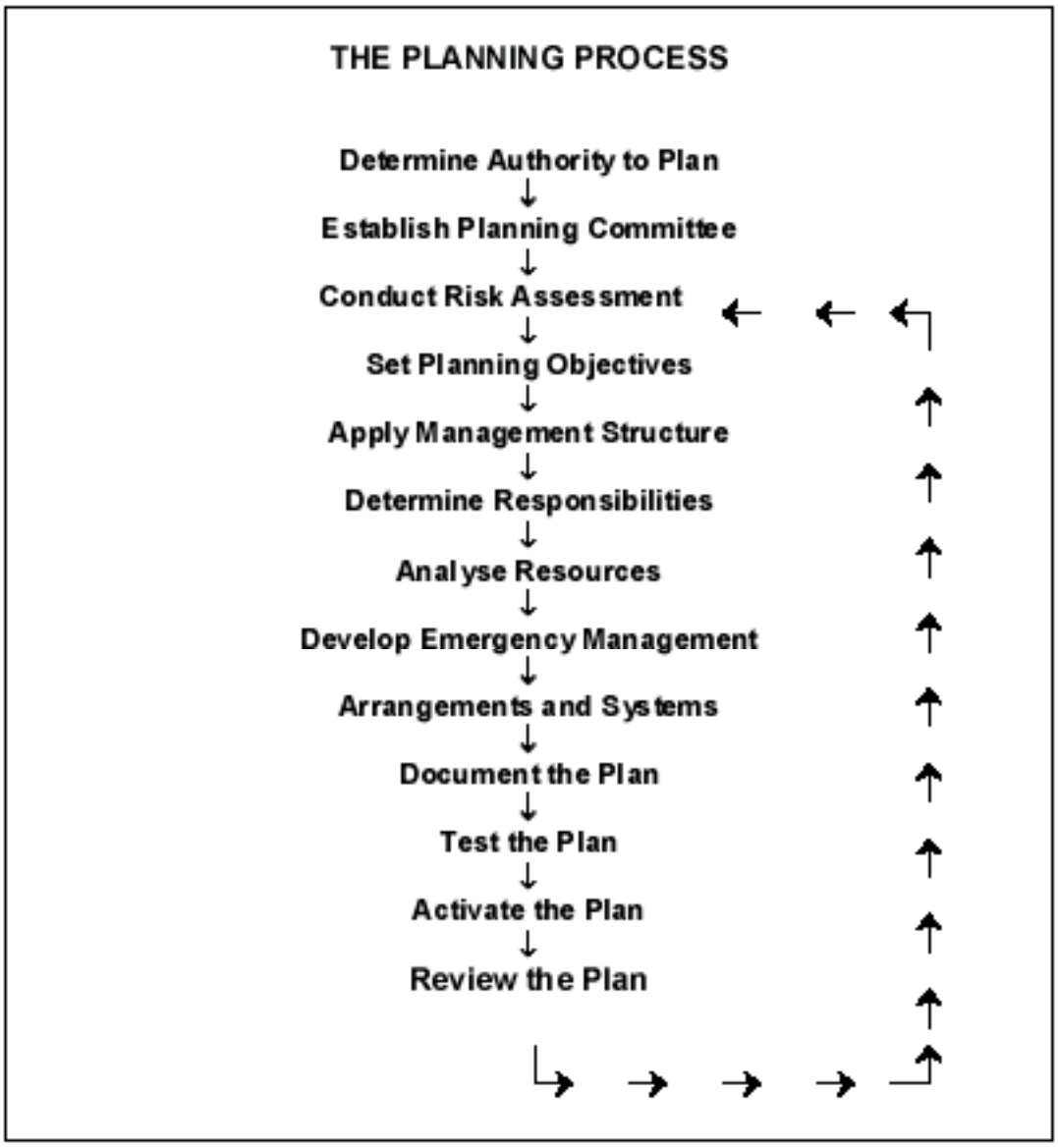
10. The interactive process of planning should result in:

- assessment of a community's hazards, vulnerabilities, and risks of disasters and their likely effects;
- strategies encompassing prevention, preparedness, response and recovery;
- an understanding of other agencies' roles and responsibilities;
- strengthening of emergency networks; and
- a comprehensive written plan.

PRINCIPLE
A community's ability to manage emergencies and disasters effectively will depend on whether it has prepared plans encompassing prevention, preparedness, response and recovery strategies.

THE PLANNING PROCESS

11. There are different ways to prepare emergency management plans. The Australian Emergency Manual (AEM)—*Community Emergency Planning Guide* provides a suggested structure for the planning process, from which all related programs, strategies and arrangements should flow. The important common elements are provided below:



- ***Determine Authority to Plan***—The authority to plan is established either under legislation, by government direction, or by community agreement.
- ***Establish Planning Committee***—The formation of State, regional/district, and local planning committees encourages involvement of all appropriate organisations. The planning committee should contain representatives of all organisations, which are involved in emergency management at that particular level. In health planning, the committee should comprise

representatives of all components of the health system, including public health, mental health, ambulance, hospitals (both private and public), and medical practitioners, and links identified with other emergency management planning committees, such as police, SES, fire and rescue, and local government.

- ***Conduct Risk Assessment*** (incorporating hazard and vulnerability analyses and epidemiology)—Risk assessments describe in detail the hazards that may impact on the community in question, the vulnerabilities of the community to these hazards and the built, natural and social environments which surround the interaction between hazards and communities. Through this process the scope and priorities for planning, including health, are identified. Disaster epidemiology provides health planners with information on the health problems associated with disasters. This is described in further detail later in this Chapter.

- ***Set Planning Objectives***—Planning objectives are based on the results of analyses and detail the required emergency management strategies. Health plans will contain the strategies to minimise the negative health effects of emergencies and disasters.

- ***Apply Management Structure***—Management arrangements are determined by planning committees, in accordance with legislation, government direction, or by other authorities. Health plans and management arrangement should integrate with the overall emergency management plans as well as higher level health plans.

- ***Determine Responsibilities***—Agreement on the roles and responsibilities of participating organisations must be reached. In health terms, for example, this may include responsibilities of health personnel (eg liaison officers), health facilities (eg medical teams) and volunteer organisations (eg first aid responders). Once roles and responsibilities are agreed, there will be a requirement to ensure that individuals are competent to perform effectively, and if not, appropriate training should be provided.

- ***Analyse Resources***—A resource analysis is undertaken to identify the resources required for effective emergency management, the resources currently available within the community, and any shortfalls (and surpluses) that exist. Arrangements to overcome shortfalls should be made. Access to further resources may be covered in higher level plans or through mutual aid arrangements.

- ***Develop Emergency Management Arrangements and Systems***—The planning committee identifies and develops specific management arrangements and strategies for prevention, preparedness, response and recovery. The group may also identify other emergency management issues and refer these to appropriate agencies for attention. There is also a requirement to design emergency management systems, which may include: communications, public education, emergency operations centre management, effective liaison, information management, public information, resource management, training and performance evaluation,

and financial management. Health emergency management arrangements should address public and mental health requirements, as well as the acute medical response.

- ***Document the Plan***—Detailed documentation begins as soon as the planning process commences. Documents resulting from the planning process may include the results of risk analyses, the main plan, the prevention, response and recovery plans, functional (including health) and special plans; and emergency service procedures. Special health plans may include hospital plans and evacuation and care arrangements for vulnerable persons and health facilities. The final agreed documents should be printed and distributed to users according to their needs.

- ***Test the Plan***—Once documentation is complete, the operational aspects of the plan should be tested (exercised) to measure the extent to which the planning objectives have been achieved. Further details on conducting exercises are contained in Chapter 20.

- ***Activate the Plan***—Emergency management plans must cover in detail the process for the activation of plans and other arrangements. Activation of a functional plan (for example, health) will usually occur after conference and agreement between the appropriate functional controller and the operational authority at that particular level. Plans will normally be activated in stages, although timing may be condensed in some circumstances.

- ***Review Plans***—It is important plans are regularly reviewed and updated. Review of plans may result from operations, exercises, a prescribed program for reviewers, or significant changes to hazards, the community, or the environment. Planning is a continuous process. The written plan is a living document, constantly being reviewed and updated.

PRINCIPLE
Best practice requires preparation, practising and review of disaster plans.

12. Operational plans should include:

- authority signed jointly by participating organisations;
- aim and scope of plan;
- procedures to ensure timely activation and the phases of activation;
- control and command procedures;
- arrangements for the coordination of support;
- the location of the Control Centre, with an alternative;
- information and communication management strategies;
- dates for the review and exercise of the plan;

- date of issue on every page;
- distribution of the plan; and
- annexes which include specific operational procedures, chain of command, duty statements, personnel and means of contact, resources and debrief procedures.

PRINCIPLE
The process of planning is more important than the written documents that result.

CONDUCT RISK ASSESSMENT

13. Disaster risks differ between communities and within communities. Disaster managers should conduct risk assessments to identify the hazards which may affect a community, the parts of the community which are vulnerable to them, and any likely effects resulting from their interaction. Disaster effects could include: deaths, injuries and disease, food shortages, social disruption, infrastructure damage and loss of services, damage to private property, economic disruption and environmental damage.

14. Managers must then determine how these risks should be managed. The range of management options include prevention, preparedness, response and recovery strategies. Health planners should identify the health implications associated with these risks and determine how they should be managed most effectively.

15. The effects of disasters is determined by a number of factors, including:

- the type, frequency and intensity of the hazard;
- the predictability of the hazard and speed of onset, including the warning period, if any;
- the duration and area of impact;
- the location of the disaster area;
- the implementation of prevention measures which build community and individual resilience;
- preparedness of the community including individual and community preparedness measures, and the preparation of response and recovery plans;
- the quantity and quality of resources available, including equipment and personnel; and
- access to other sources of assistance.

Hazard Analysis

16. A hazard can be defined as ‘a source of potential harm or a situation with a potential to cause loss; a potential or existing condition that may cause harm to people or damage to property or the environment; an intrinsic capacity

associated with an agent or process capable of causing harm'. Hazards may result from either extremes of nature, or technological causes. They vary in their intensity, frequency, area affected, warning time, and how they can be managed. Hazards only become disasters when they impact on vulnerable communities. Hazards can be classified into the following categories:

- ***Natural/Biophysical***—eg cyclones, earthquakes, fires, floods, landslides.
- ***Technological/Sociotechnical***—eg chemical, transport (aircraft, motor vehicle, shipping, rail), terrorist-instigated events.

Vulnerability Analysis

17. Vulnerability can be defined as the degree of susceptibility and resilience of the community and environment to hazards. Information is gathered on characteristics which describe the vulnerability of the community to hazards. Characteristics include the demographic profile, cultural attitudes, high risk groups, economic status, quality of infrastructure, community services and resources, land management, environmental factors. Vulnerable groups in the community, such as the elderly, children, the poor and caravan park residents may be disproportionately affected by disasters. This is for a number of reasons, including building standards, mobility, disabilities, educational levels, access to medical care and nutritional status.

Disaster Epidemiology

18. Disaster epidemiology can be defined as the discipline that studies the influence of such factors as lifestyle, biological constitution and other personal or social determinants on the incidence and distribution of disease as it concerns disasters.

19. Disaster epidemiology can be used to measure and describe the adverse health effects of disasters, and the factors that contribute to these effects. It has been well recognised that different types of disasters are associated with different patterns of illness and disease. Similarly, specific medical and health problems tend to occur at different times after the disaster's impact.

20. The objectives of disaster epidemiology are to:

- assess the needs of disaster-affected populations;
- match needs to available resources;
- prevent adverse health effects;
- evaluate program effectiveness (such as immunisation programs); and
- permit more effective planning.

21. Disaster epidemiology may involve:

- disease surveillance;
- evaluations of the public health impact of a disaster;
- evaluations of the natural history of the disaster's acute health effects;
- analytic studies of risk factors for adverse health effects;

- clinical investigations of the efficacy and effectiveness of particular approaches to diagnosis and treatment;
- population-based studies of long-term health effects;
- studies of the psychosocial impact of a disaster; and
- evaluations of the effectiveness of various types of assistance.

22. Tools utilised may include rapid field assessments of health effects, reporting from health facilities and practitioners, environmental health surveys, disease surveillance and nutritional assessments.

23. A table of disasters and their health effects appears at Annex A to this Chapter.

Implications for Health Planners

24. Health planners at National, State, local or health facility levels can apply disaster epidemiology in all phases of disaster management (prevention, preparedness, response and recovery) to manage the health effects of disasters. Effective management of health aspects of disasters must incorporate a total health approach, involving the components of:

- public/environmental health;
- acute medical care;
- ambulance services;
- first aid; and
- mental health.

25. Effective health management depends on anticipating health problems, and delivering the appropriate interventions to minimise or prevent their effects. This will enable health planners to manage limited health resources effectively.

26. Epidemiology can assist health planners by identifying those groups more at risk from specific types of disasters, and the types and patterns of injury and illness resulting. For example, traumatic injuries occur mainly at the time of impact, whereas increased disease transmission takes longer to develop, as do the mental health consequences.

27. Up to 80 per cent of persons injured in most disasters usually require only routine treatment for superficial injuries such as bruising and abrasions. Up to 20 per cent are likely to suffer from a single major injury such as a fracture. Frequently, less than 10 per cent are severely injured. Most of the serious injuries occur as an immediate outcome of the impact of the disaster and demand immediate attention.

HEALTH RESPONSE PLANS

28. Health and Medical Functional Plans, developed by the Health and Medical Planning Committees utilise the total medical and health resources in the area. They must be integrated with other disaster response agencies and are designed to provide:

- command, control and co-ordination of resources;

- appropriate pre-hospital medical and health management for casualties;
- transportation of casualties to appropriate hospitals for definitive treatment and care;
- public health advice and warnings to responders and the community;
- psychological and counselling services for disaster affected persons;
- on-going medical and health services required during the recovery period to preserve the general health of the community; and
- provision for persons with a disability or other form of special need, including cultural considerations.

SPECIAL CONSIDERATIONS IN HEALTH RESPONSE PLANNING

Time Delay to Resuscitation

29. Mortality from trauma typically occurs in one of three distinguishable time periods. These are:

- seconds to minutes (usually from unsurvivable head or major vessel damage);
- one to two hours (usually from major chest, head or abdominal injuries, and/or major blood loss); and
- days to weeks (usually from brain death, sepsis and organ failure). Accurate diagnosis and resuscitation in the first hour may significantly reduce this second peak of mortality.

Time Delay to Surgery

30. In addition, data from military studies suggests that for battle casualties who require surgical intervention, there is a dramatic increase in the mortality rate for those who remain untreated for three hours after wounding. After six hours there is a further dramatic increase in eventual mortality and morbidity. Accordingly, for serious casualties, initial wound surgery should be performed as soon as possible, but certainly within the three hour limit.

Initial Phase

31. This involves deployment of (probably) local resources to provide immediate attention and identification of the health and medical problems. In the initial phase the requirement is for appropriately trained medical personnel to travel to the site and conduct medical reconnaissance, initial triage and resuscitation.

Follow-up Phase

32. This involves a designated medical services coordinator arranging more definitive medical care which, in some circumstances, could involve the acquisition or employment of additional regional, State or National medical resources. In the follow-up phase the requirement is for:

- medically trained persons to travel to the site and treat casualties in place and/or stabilise casualties in preparation for evacuation;
- evacuation of casualties for treatment elsewhere; and
- public health support.

33. Some of the special considerations which need to be addressed include the provision for:

- care for people with disabilities;
- care for the detainees in correctional institutions;
- response for the remote area occurrence; and
- special planning involvement for major events.

Care for People with Disabilities

34. It is essential that each community is aware of persons with some form of disability who may, in times of major incidents or disasters, need to have special provisions made in respect of evacuations, transport and continuing care and treatment. Health and community service groups who deal with persons with disabilities on a day to day basis need to be involved in the planning process as they are probably the best suited to identify such persons and to provide centralised records which can be provided to various emergency service responders. Where such persons are housed in special accommodation or institutions, special plans and arrangements will be in place and need to be considered by the community and response agencies for response and recovery purposes in the main plan.

Detainees in Custodial/Correctional Institutions

35. The provision of services to persons from these institutions may involve non-medical personnel such as correctional service officers and the police. In such cases additional care may be needed for the security and management of health personnel and/or equipment to prevent, for example, a possible hostage situation involving health personnel.

Remote Area Planning

36. Whilst clinical management principles remain the same regardless of situations, planning for the remote area disaster will require that the key factors of time delay period and casualty deterioration rate are adequately addressed. The effect of an obvious range of difficulties inherent with accessibility, distance or isolation may be minimised with good prior planning and arrangements.

Major Events

37. Major or special events can be a common factor in creating mass casualty situations. Health professionals from all areas of health, medical and ambulance should be actively involved in the planning for such events in an endeavour to prevent mass casualty situations arising or at least be prepared for their potential occurrence. Reference should be made to Chapter 16—*Mass Gatherings*, or the Australian Emergency Manual—*Safe and Healthy Mass Gatherings*: Health and Safety Guidelines for Public Events, recently published by Emergency Management Australia.

Common Difficulties in Disaster Response Planning

38. Frequently encountered problems in disaster response planning include the following:

- ***Communication***—Communication facilities (all forms) are inevitably overloaded and information management may be difficult to control or coordinate.
- ***Knowledge***—there tends to be insufficient knowledge or recognition of available on-site resources and services, and specialised alternative emergency resources are often difficult to identify and mobilise.
- ***Planning***—there is often a lack of adequate planning, training and exercising to prepare for the special needs of disasters.
- ***Key Objectives***—the key objectives of counter-disaster plans, including agency roles, are not clearly defined and understood, often due to agencies having multiple day to day responsibilities.
- ***Coordination***—coordinated response from an area remote from the scene is often difficult as agencies keep information and requests ‘in house’ and the coordination is overlooked at the provider end - inadequate coordination can result in reaction delays or overload.
- ***Environment***—environmental factors such as the weather, terrain and natural resource depreciation often directly impinge upon the response phase.
- ***Control***—control can be difficult when scarce resources are stretched.
- ***Capability***—capability always seems to fall short of what was expected.
- ***Limited Outlook***—parochialism hinders a coordinated response.
- ***Basic Necessities***—the provision of adequate water, food and shelter for the disaster victims and responders particularly in remote locations.

- ***Prepared Response***—those persons responding to remote area incidents must be physically fit for the task ahead and **self sufficient for food, water and the basic essentials for at least the initial period**.

SUMMARY

39. The development of comprehensive plans, based on consultation with key health agencies, is crucial in managing the health effects of disasters.

40. Health plans should be integrated with the overall plans of other disaster management agencies.

41. Some specific groups or situations require special consideration in health planning.

42. Disaster epidemiology should be used during all phases of disaster management as it can provide valuable information regarding the adverse health effects of disasters and the factors that contribute to these effects.

REFERENCES

43. References used in this Chapter are as follows:

- Dolan, C., **Hazard-Wise,** Emergency Management Australia, 1995.
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- Santy, M.P. (English translation of article): **Bulletin de la Societe Medico-Chirurgicale**, Paris, France, Vol 44, 1918, pages 207–214.
- Withers, D.J., A Rapid Response Medical Capability for Australia. **The Macedon Digest—The Australian Newsletter of Disaster Management.** Mt. Macedon, Victoria, Volume 6 Number 1, March 1991, pages 8–10.

Annex:
A. Disasters and their Health Effects

DISASTERS AND THEIR HEALTH EFFECTS

Hazard	Environmental Effects	Deaths	Severe Injuries	Public Health Consequences	Population Movement/ Evacuation
Earthquake	Building collapse. Disruption to utility supply. Heavy dust. Frequent fires and chemical spills	Many	Overwhelming	Loss of utilitieshygiene, sanitation Many homeless	Rare
Floods (slow moving)	Vehicles/caravans and buildings washed away	Few	Few	Water supply, hygiene, sanitation Risk of watervector-borne disease Many homeless	Common
Fires (bush or structural)	Devastation of crops, forests, pastures, structures. Smoke damage. Toxic gases.	Few	Few	Disposal of livestock.	Common
Cyclones (includes potential storm surge and flash flooding)	Damage to community infrastructure, residences, crops.	Windsfew Flashflooding/ surgemany	Windsmoderate (trauma from flying debris) Flashflooding/ surgefew	Water supply, hygiene, sanitation Risk of watervector-borne disease Many homeless	Common
Chemical (direct spill or leaching into soil and water table)	Contamination of water table/soil may occur. Fires. Air pollution.	Effect depends on toxicity, route of exposure and does for workers, rescuers, adjacent and distant communities. Cross contamination. Morbiditymay be chronic		Decontamination of casualties. Contamination of water supply. Long-term environment/health consequences.	Common

Terrorist-instigated event (explosive, chemical, biological, radiological attack)	Devastation of immediate environment Building collapse. Flying debris.	Many	Many	Restoration of utilities. Decontamination.	Rare (as required)
Transport (from human error, mechanical failure or terrorist action)	Disruption to transport. Fire Chemical spill	Multiple fatalities.	Many	May be significant mental health effects	Rare

CHAPTER 4

PUBLIC HEALTH—PREVENTION AND MITIGATION

INTRODUCTION

1. The impact of hazards on communities may be prevented or mitigated by a variety of strategies. These strategies will involve modification of the hazard, or more often reduction in the vulnerability of a community to hazards.

INTER–SECTORAL APPROACH

2. Through epidemiology studies and research, health professionals can contribute to an inter-sectoral approach to prevention/mitigation. Possible strategies involving an inter-sectoral approach include:

- zoning/land use management;
- building codes;
- building use regulations;
- relocation of potential hazards or communities;
- safety improvements;
- legislation;
- public information;
- community awareness/indication; and
- tax, insurance incentives/disincentives.

MEASURES

3. Prevention or mitigation of natural hazards can occur through a variety of structural measures, protective engineering works such as dams, levees, sea walls, and nonstructural options including land use regulations, zoning laws, building codes, and economic programs (such as tax and insurance incentives) designed to keep vulnerable structures and activities out of the most hazard-prone areas to minimise the likelihood of structural damage. Post disaster actions such as rebuilding damaged structures in hazard-resistant ways or relocating structures and people are also mitigation strategies due to their concerns with the long term reduction of the effects of hazards.

MITIGATION STRATEGIES

4. Mitigation of technological disasters can range from altering expectations and the choices of technology to preventing or lessening the consequences of a hazard, as indicated above.

5. Many aspects of public health contribute to reducing the risks of disaster. Good health status is in itself a protective measure. Mitigation strategies can be identified by considering the epidemiology of disasters, as well as taking into account characteristics of the community, such as vulnerability.

Prevention strategies also need to be epidemiologically evaluated as to their effectiveness. Specific health interventions that contribute to prevention / mitigation of disasters may include:

- immunisation for appropriate diseases;
- chemoprophylaxis as appropriate;
- sanitation measures;
- personal hygiene;
- refuse and hazardous waste disposal;
- vermin and vector control;
- immigration controls and custom legislation;
- education programs;
- media campaigns;
- public warning notices; and
- incident data collection, analysis and dissemination.

SUMMARY

6. Hazard modification and reduction in community vulnerability are key strategies in the approach to prevention and mitigation.

7. The impact of hazards can be prevented or mitigated through the use of epidemiological studies and research.

8. Epidemiological evaluation is important in determining the effectiveness of key strategies

REFERENCE

9. Reference for this Chapter is as follows:

- Emergency Management Australia: **Australian Counter—Disaster Handbook Volume 1, Commonwealth Counter—Disaster Concepts and Principles**, 1993, ISBN 0 642 19581 1.

CHAPTER 5

HEALTH RESPONSE AND DISASTER SITE MANAGEMENT

INTRODUCTION

1. The purpose of this chapter is to provide a guide for the efficient management of health resources in a disaster. This may range from an event where there is a concentration of casualties in a restricted area eg bus crash, to an incident spread over a wide area which will require multiple field management structures eg earthquake.

2. All health care professionals have a duty to understand the disaster management arrangements, which will include command, control and coordination, their roles and those of other involved agencies, thereby ensuring an effective medical response. This will require participation in appropriate education programs and regular exercises.

PRINCIPLE
Effective management will provide optimal care for the maximum number of casualties.

MANAGEMENT STRUCTURE

3. In all States and Territories, there is need for a management structure which encompasses State/Territory and regional levels, within hospitals and at the incident site. Additionally, the mutual aid arrangements between States/Territories should be addressed. Please refer to Chapter Three on Planning for further information.

COMMAND, CONTROL, COORDINATION AND COMMUNICATION

Introduction

4. Arrangements often referred to as the four C's, command, control, coordination and communication are vital to the management of the diverse resources that will be involved in the response to any major emergency or disaster.

5. It is important that the response planned and provided from the Health and Medical agencies during disasters are directed in the same manner using this terminology. This will serve as a medium to enhance or clarify position functions to other participants where similar roles and functions occur.

6. The widely accepted definitions throughout Australia of the terminology of Command, Control and Coordination, are outlined as follows:

Command

7. Command is the direction of members and resources of an organisation in the performance of the organisation's role and tasks. Authority to command is established in legislation or by agreement within an organisation. Command relates to organisations and operates vertically within an organisation.

Control

8. Control is the overall direction of emergency management activities in a designated emergency or disaster situation. Authority for control is established in legislation or in an emergency plan, and carries with it the responsibility for tasking and coordinating other organisations in accordance with the needs of the situation. Control relates to situations and operates horizontally across organisations.

Coordination

9. Coordination is the bringing together of organisations and resources to ensure an effective emergency management response. It is primarily concerned with the systematic acquisition and application of resources (organisational, personnel and equipment) in accordance with the requirements imposed by the threat or impact of an emergency or disaster. Coordination relates primarily to resources and operates vertically within an organisation as a function of the authority to command, and horizontally, across organisations, as a function of the authority to control.

PRINCIPLE
Disasters create the need for coordination between all participating agencies. This requires reliable inter-agency communication.

Establishing Medical Control

10. In all major emergencies and disasters, establishing control over the situation in the early part of the response is difficult. The Medical and Health Emergency Planning Authorities need to have in place, an organisation, which is well understood by all participants and which provides for a 24-hour appropriate system of communicating with, and mobilising, the required medical and health response.

Communication

11. Communication is vital to ensure the two way flow of information and for the exercising of command, control and coordination, and it must be accurate and timely.

12. The inability to adequately communicate is the downfall of the majority of responses to major incidents or disasters. This occurs either through the failure of the communications hardware, or the personnel involved in the response.

13. Two of the pitfalls to address are misunderstanding and misinterpretation. Misunderstanding in sending or receiving a message can be reduced by training personnel in the art of communicating, especially where these

personnel will need to use some mechanical means of communication. Misinterpretation occurs where personnel believe they understand the intricacies of another organisation and therefore provide an interpreted message. To avoid this we must provide personnel who understand their organisation fully, both its resources and operation, for face to face liaison.

INTELLIGENCE

14. Invariably, there will be a number of organisations or agencies that require intelligence to enable appropriate actions to be taken. Intelligence that needs to be shared includes:

- continuous assessment of the emergency situation;
- requirement of responders, including resources, arrival times, priorities; and
- command, control and coordination measures.

15. Officers-in-charge should constantly be aware of the needs of various agencies and ensure that information is appropriately disseminated. Jargon should be avoided to reduce the risk of misinterpretation.

COMMUNICATIONS

16. Communications relates to the equipment and modes by which contact is made. It must be assumed during emergencies or disasters that normal modes of communications may be impaired. This may be due to damage to equipment, excessive use of existing facilities, or the lack of facilities.

17. It is therefore imperative when establishing a communications network that consideration is given to ensuring the equipment is robust enough to withstand the rigors of most hazards and provides some spare capacity for expanded and extended use.

18. Where limitations are known to exist, planners should ensure that they know where, and how, alternative or additional back-up communications systems can be obtained. In the worse case scenario this may need to be by means of a message courier. Whenever possible, responding agencies should be self sufficient in communications.

19. Mobile communications technology, such as mobile facsimile, cellular and satellite telephones and message pagers may be useful in supporting disaster response. However, they should not be relied upon as the primary means of communications.

PRINCIPLE
In a disaster, coordination problems are often communication problems in disguise.

Communications Network

20. A South Australian example of a communications network appears at Annex A to Chapter 5.

21. In emergencies or disasters, communications are a major problem for managers. All participants must be trained in the use of communications systems. Information on communications systems and methods, maintenance and operation of equipment, and communications management is contained in the Australian Emergency Manual—*Communications*. This is available on request from your State/Territory Emergency Service and is recommended reading.

STATE LEVEL DISASTER MANAGEMENT

22. Within a State Disaster or Emergency Plan there is generally an established number of functional service groupings. Health is one of these groupings. Such arrangements are to enable the establishment of effective command, control and coordination of the resources available to specific functions, especially during the response and recovery phases of a disaster/major incident operation.

23. At State and Territory level there is a State Medical/Health Controller empowered to direct health and medical resources as required. This appointee needs to liaise with all other agencies and is normally a member of the State or Territory counter disaster planning group.

24. This function may be carried out within a State Medical Control Centre using appropriate communication facilities and the expertise of the various health disciplines.

REGIONAL LEVEL DISASTER MANAGEMENT

25. There should be a Regional Zonal Medical/Health Controller whose functions equate with those of the State Medical/Health Controller, but at a regional level.

HOSPITAL

26. All hospitals should develop plans to provide a management structure for:

- reception of mass casualties;
- medical team response to mass casualty incidents; and
- incidents where the hospital itself is a ‘casualty’.

For further information on hospital planning, refer to Chapter 9 on Hospital Disaster Planning.

DISASTER SITE MANAGEMENT

27. Responders can anticipate initial chaos and confusion at the emergency/disaster scene. If time is not taken to establish some form of control, then the confusion will continue for a longer period. It should also be anticipated that there may have been some initial intervention by unqualified or inexperienced bystanders. Additionally, trained volunteers maybe available to

assist, and these individuals or organisations must be included in the total medical management.

MEDICAL INCIDENT MANAGEMENT

28. Medical incident management at a site is a progressive process. It is essential for the first medical responders, normally ambulance personnel, to quickly:

- gather intelligence of the incident;
- provide situation reports to the Ambulance Communications Centre;
- establish the initial medical control points, as listed in site arrangements below; and
- establish liaison with other services on site.

29. As a result of information provided to the Ambulance Communications Centre, additional resources will be provided as necessary.

DOCUMENTATION

30. Complete, accurate and contemporaneous documentation is essential during a disaster in order to:

- achieve continuity of patient care;
- identify responders and their actions at the scene, plus any injuries incurred by staff;
- identify change in command and the time of the change;
- have a record of changing circumstances during the disaster;
- have a permanent medico-legal record; and
- enable subsequent research.

SITE ARRANGEMENTS

31. The size of the incident will dictate the need to establish medical control points. Example of these control points are as follows:

- ***Forward Command Post***—This is the area where operations are directed and controlled by the medical and ambulance commanders and should be:
  - collocated with other emergency services;
  - up-wind of the incident site, in a secure area; and
  - easily identifiable to all personnel (a green rotating beacon is recommended to identify the medical command post).
- ***Casualty Collecting Area***—The casualties are initially triaged at the incident site if it is safe to do so. If rescue services are extricating casualties from a hazardous area, a casualty collecting site may be established as near as possible to the incident site, in an area safe for personnel to perform their duties.

- ***Patient Treatment Post***—The area established for triage and treatment of all casualties and should be:
  - as near as possible to the incident site to alleviate long distance carrying;
  - large enough to accommodate the casualties and those treating, with easy access and egress;
  - ideally in an area protected from the elements; and
  - in an area safe from the effects from the incident.
- ***Ambulance Loading Point***—The area where patients are loaded and patient identity and destination are recorded, which should be:
  - as near as practicable to the exit of the patient treatment post;
  - large enough to accept more than one vehicle with easy access and egress, ideally 'one way' access only; and
  - located in a safe area bearing in mind the incident and other traffic.
- ***Ambulance Holding Point***—The area where ambulance vehicles are marshalled if the ambulance loading point is not able to accommodate them and should be:
  - as near as practicable to the ambulance loading point, but not cause traffic congestion;
  - easily accessible with good egress;
  - large enough to accommodate all responding ambulance vehicles; and
  - in the area with proven communications with the ambulance loading point and the forward command post.

PRINCIPLE
Establishment and maintenance of medical control is essential.

SITE MANAGEMENT AND PERSONNEL

32. The nomenclature of specific medical personnel varies between States and Territories. However, the basic roles are not dissimilar. The example of site personnel set out below, and in the following annexes is not definitive, and consideration may need to be given to additional roles such as Field Nurse Commander and Nurse Team Leader. Where possible, all roles and management sites are listed in the glossary. All ambulance, health and medical personnel should refer to their own organisational arrangements. Core site personnel roles include the following:

- ***Ambulance Transport Officer***—Normally one of the first ambulance officers on site who will assume the initial function of medical control, including the selection of suitable sites for casualty management and communications.
- ***Ambulance Casualty Officer***—Normally one of the first ambulance officers on site and who is required to estimate casualty numbers, hazards or unsafe areas, additional resources required and commence primary triage and treatment.

- ***Triage Officer (Ambulance)***—Upon the arrival of additional ambulance personnel, the most medically skilled officer will assume this role, commencing triage and tagging of casualties in the field.

- ***Ambulance Marshal***—Upon the arrival of additional ambulance personnel, an officer will assume the role, marshalling all ambulance vehicles and personnel.

- ***Ambulance Commander***—This officer will be appointed by Ambulance Operational Control and will assume command of all ambulance resources at the site. In the absence of a field medical controller, this officer will assume the medical control function.

- ***Ambulance Liaison Officer***—This officer will be appointed by the Ambulance Commander and shall establish a medical liaison with other responding agency commanders.

- ***Field Medical Commander***—A medical officer who is appointed to control the medical management at the site and is in command of all medical teams.

- ***Medical Team Leader***—A medical officer who is responsible for the management of a hospital team at the site.

- ***Medical Triage Officer***—A suitably skilled medical officer who is responsible for triage within the patient treatment post.

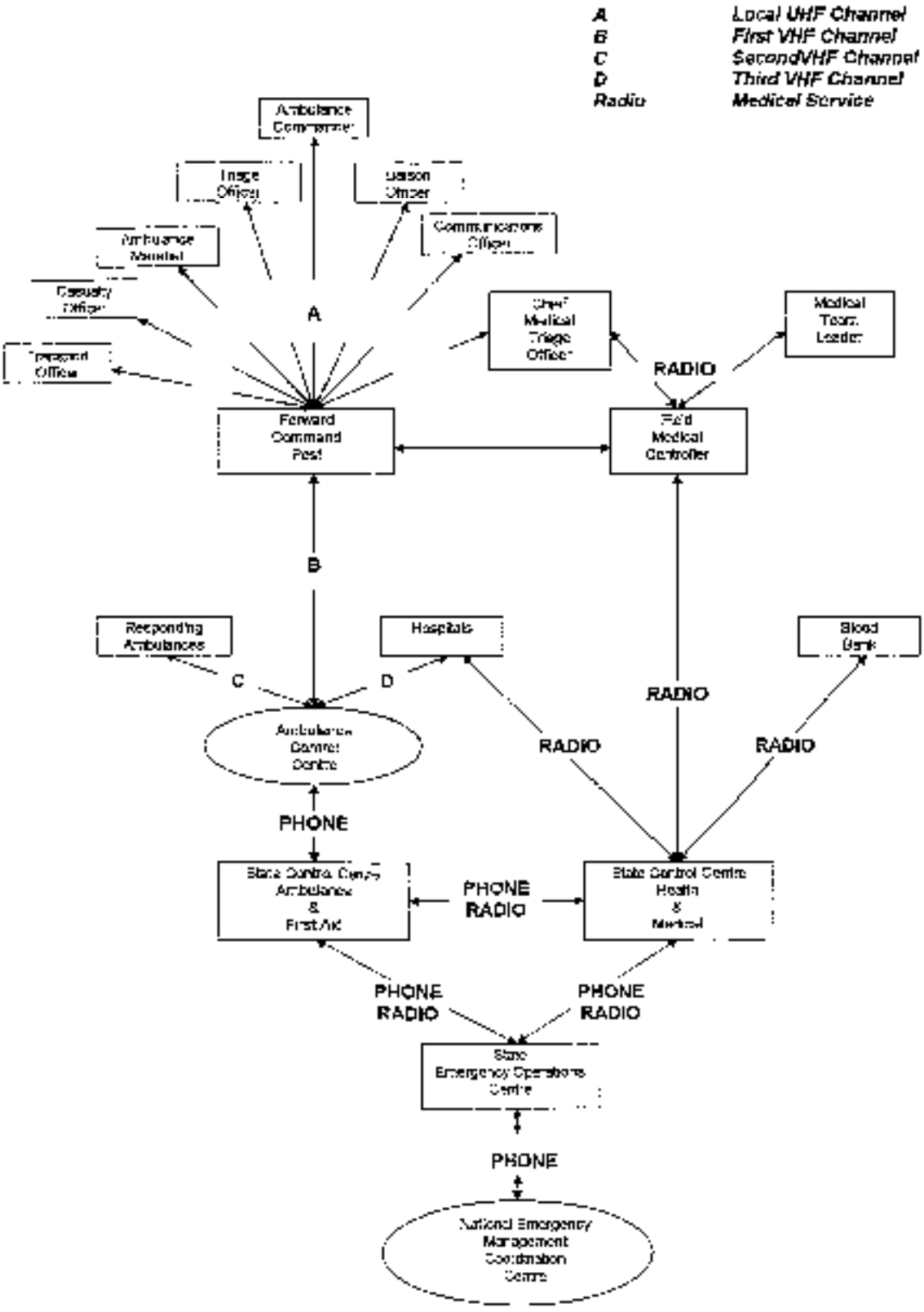
- ***Nurse Commander***—A suitably qualified and extensively experienced nurse who is responsible for the nursing response at a major incident/disaster site.

SUMMARY

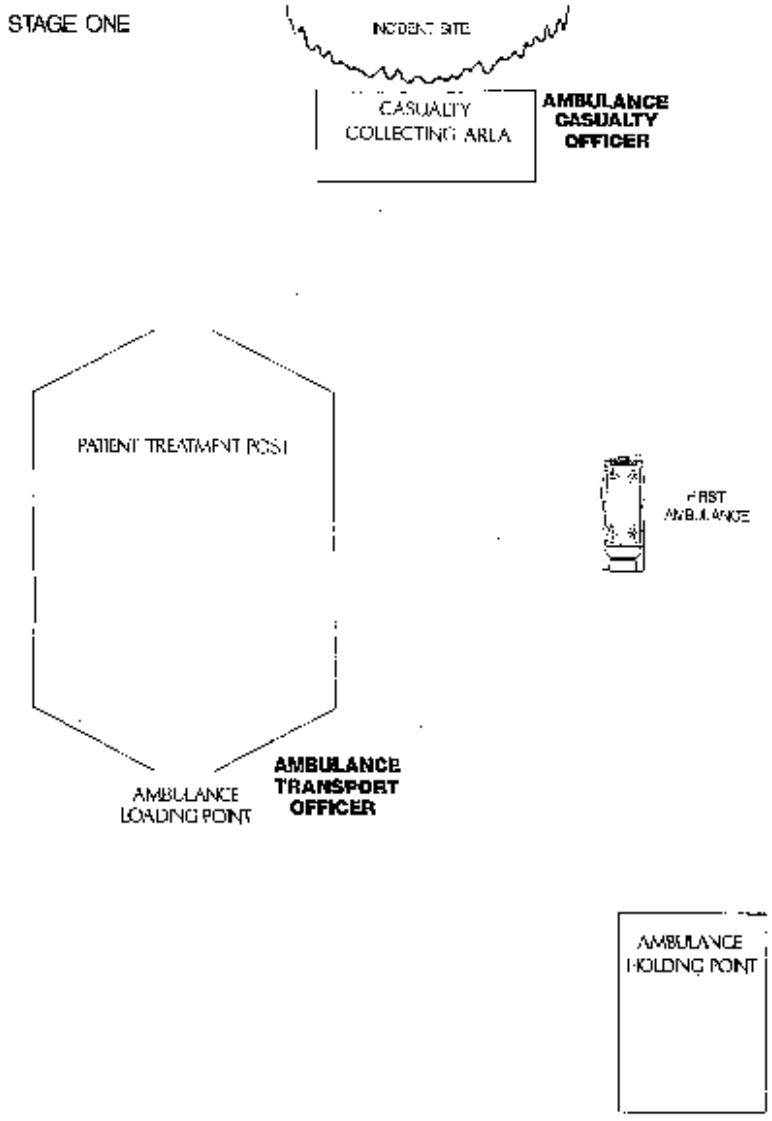
33. Understanding disaster management arrangements, including Command, Control, Coordination and the roles of all agencies involved will ensure an effective medical response if supported by education and training.

Annexes:
A. Communications Network (South Australian example)
B. Site Management and Personnel (South Australian example)
C. Site Personnel

COMMUNICATIONS NETWORK (SOUTH AUSTRALIAN EXAMPLE)



SITE MANAGEMENT AND PERSONNEL (SOUTH AUSTRALIAN EXAMPLE)



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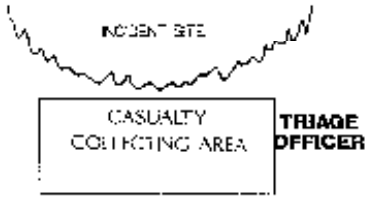
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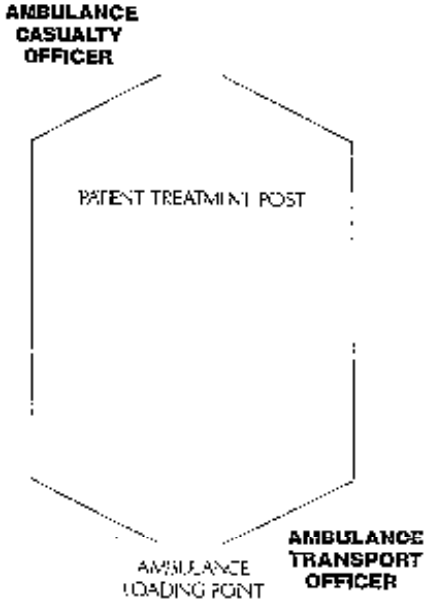
COLLECTING AREA
TRIAGE
OFFICER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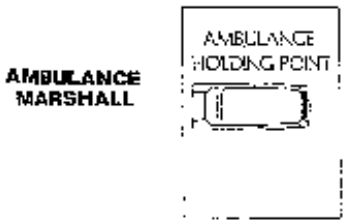
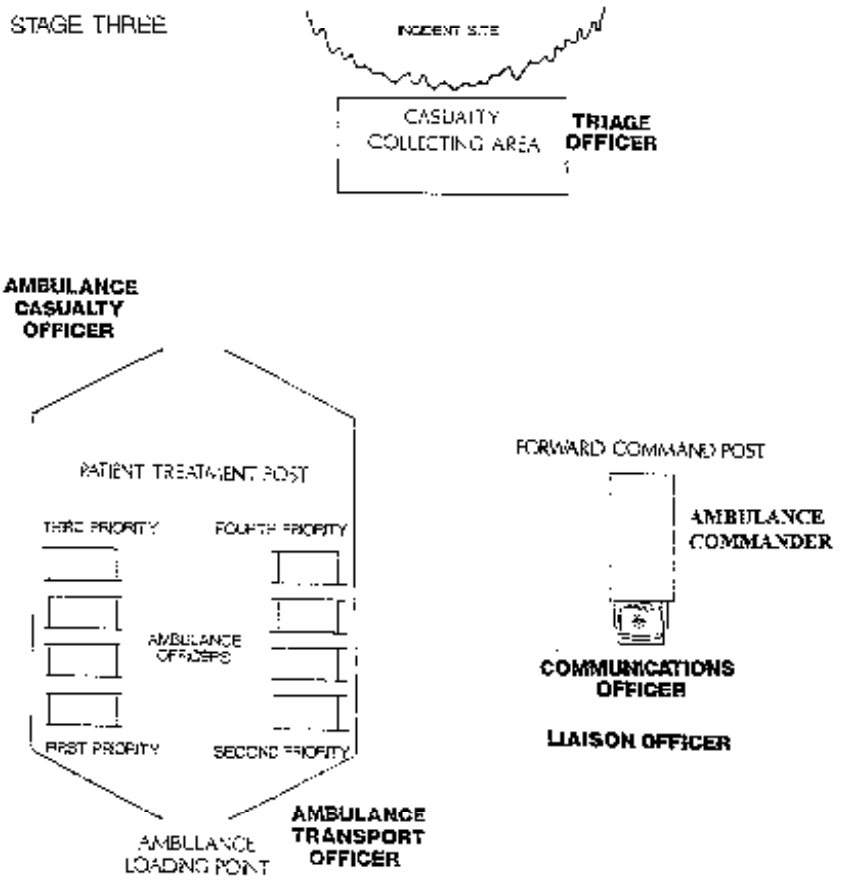
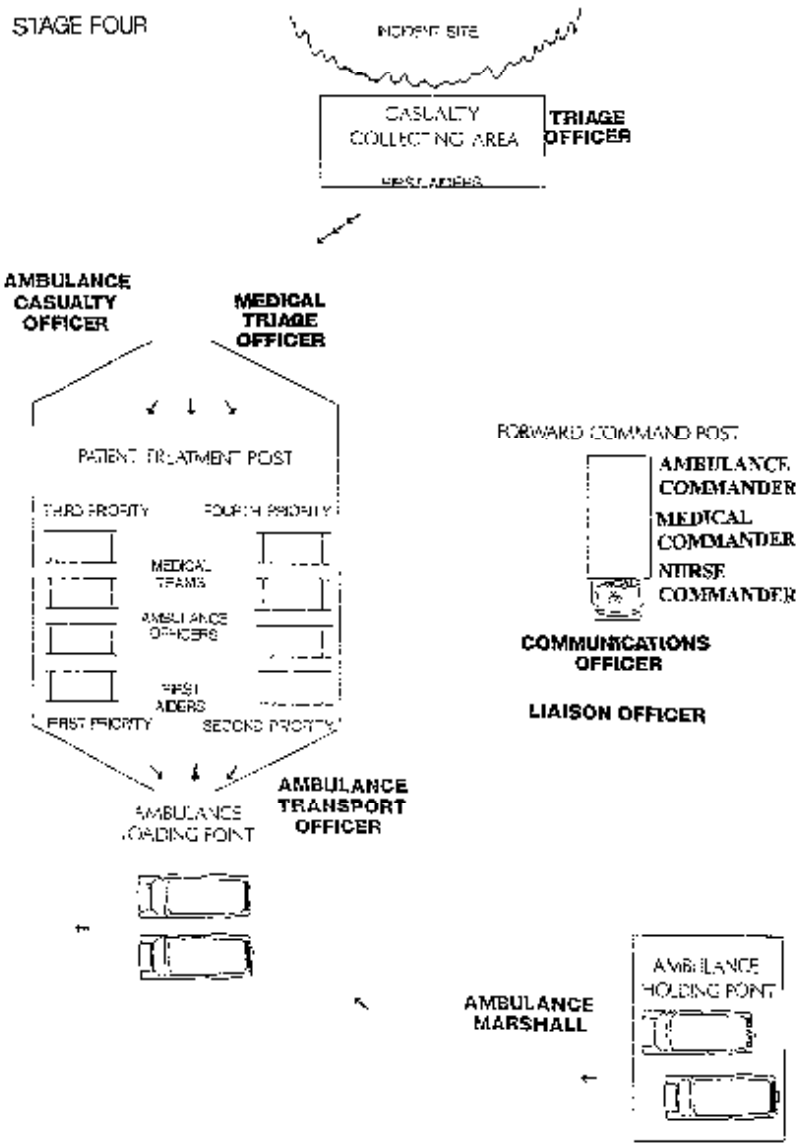
CASUALTY
OFFICER
PATIENT TREATMENT POST
AMBULANCE
LOADING POINT
AMBULANCE
TRANSPORT
OFFICER


FIRST
AMBULANCE


AMBULANCE
MARSHALL
AMBULANCE
HOLDING POINT


STAGE THREE
INCIDENT SITE
CASUALTY COLLECTING AREA
TRIAGE OFFICER
AMBULANCE CASUALTY OFFICER
PATIENT TREATMENT POST
THIRD PRIORITY
FOURTH PRIORITY
AMBULANCE ORDERS
FIRST PRIORITY
SECOND PRIORITY
AMBULANCE LOADING POINT
AMBULANCE TRANSPORT OFFICER
FORWARD COMMAND POST
AMBULANCE COMMANDER
COMMUNICATIONS OFFICER
LIAISON OFFICER
AMBULANCE MARSHALL
AMBULANCE HOLDING POINT


STAGE FOUR
INCIDENT SITE
CASUALTY COLLECTING AREA
TRIAGE OFFICER
FIRST AIDERS
AMBULANCE CASUALTY OFFICER
MEDICAL TRIAGE OFFICER
PATIENT TREATMENT POST
THIRD PRIORITY
FOURTH PRIORITY
MEDICAL TEAMS
AMBULANCE OFFICERS
FIRST AIDERS
FIRST PRIORITY
SECOND PRIORITY
AMBULANCE LOADING POINT
AMBULANCE TRANSPORT OFFICER
FORWARD COMMAND POST
AMBULANCE COMMANDER
MEDICAL COMMANDER
NURSE COMMANDER
COMMUNICATIONS OFFICER
LIAISON OFFICER
AMBULANCE HOLDING POINT
AMBULANCE MARSHALL

SITE PERSONNEL

AMBULANCE TRANSPORT OFFICER

Responsible to the Ambulance Commander.

Initial Actions

- Advise Communications Centre of arrival at the scene.
- Confirm the exact location of the scene.
- Determine access routes for other ambulances.
- Maintain a communications link with the Control Centre.
- Establish a temporary Forward Command Post.
- Don the appropriate identification vest.

Secondary Actions

- Select suitable medical management sites—ie Patient Treatment Post, Ambulance Loading Point, Ambulance Holding Point.
- Secure the access and egress.
- Appoint an Ambulance Marshal.
- Obtain the service of someone to register the details of the casualties.
- Supervise the loading of the Ambulances.
- Maintain communications with the Control Centre and provide regular situation reports.
- Establish liaison with other emergency/support services.

Note:

On arrival at the scene of an Ambulance Commander, the Ambulance Transport Officer's role will reduce to liaison with the Ambulance Marshal, Patient Recorder and the Medical Teams working in the Treatment Post whilst facilitating the loading of Ambulances.

AMBULANCE CASUALTY OFFICER

Responsible to the Ambulance Commander.

Initial Actions

- Undertake a quick reconnaissance, and then report:
  - the estimated number of casualties;

  - any hazards or unsafe areas; and
  - additional resources needed—eg Police, Fire, Rescue, Medical Teams.

- Don the appropriate identification vest.

Secondary Actions

- Commence primary triage of casualties.
- Commence life-saving treatment only.
- Accurately determine the number of casualties, classify into stretcher or walking cases, and relay the information to the Control Centre.
- Appoint an Ambulance Triage Officer as soon as possible.
- Direct responding medical and para-medical personnel to specific casualties/areas.
- Arrange the evacuation of all casualties to the Patient Treatment Post.
- Arrange the orderly placement of casualties within the Patient Treatment Post, according to their triage priority.

Note:

On arrival of a Medical Triage Officer, the Ambulance Casualty Officer will work in close liaison with the Medical Triage Officer, and provide management of casualties within the Patient Treatment Post.

TRIAGE OFFICER (AMBULANCE)

Responsible to the Ambulance Commander.

The Ambulance Triage Officer will be located at the incident site or, if the site is of a hazardous nature, then as near as it is safe to be located given the nature of the incident and the protective clothing worn.

The Ambulance Triage Officer will label casualties and arrange for their quick evacuation to the Patient Treatment Post according to the triage priority.

Only life-sustaining treatment will be carried out in this area.

AMBULANCE MARSHAL

Responsible to the Ambulance Commander.

The Ambulance Marshal will be located at the Ambulance Holding Point and assemble the incoming ambulance vehicles in a logical and safe manner with easy access to the Ambulance Loading Point and without congesting the access for other emergency vehicles.

The Ambulance Marshal must have good communication with the Ambulance Transport Officer so that vehicles can be moved forward for loading as required. The Marshal also provides details to incoming crews on what is required of them by the commander at the site—eg remain with the vehicle or take some equipment forward to the treatment post **but ensure the keys are left in the vehicle**.

AMBULANCE COMMANDER

Responsible to the Ambulance Controller.

The Ambulance Commander is required to proceed as follows:

- Notify the Ambulance Control Centre on arrival.
- Establish or confirm the forward Command Post.
- Assume command of all Ambulance operations and if appropriate obtain a briefing from the Ambulance Transport Officer and Ambulance Casualty Officer.
- Confirm or appoint:
  - Ambulance Casualty Officer;
  - Ambulance Transport Officer;
  - Ambulance Triage Officer;
  - Ambulance Marshal; and
  - Liaison Officer.
- Confirm or determine the location of:
  - Casualty Collecting Area;
  - Patient Treatment Post;
  - Ambulance Loading Point;
  - Ambulance Holding Point;
  - access and egress routes; and
  - any other control points that may be necessary.
- Liaise with other Emergency Service Commanders.
- Ensure adequate resources are at hand or available.
- Provide regular reports to the Ambulance Control Centre reflecting whether or not the incident is escalating, static or winding down

Note:

The Ambulance Commander should assume responsibility for all Medical and First Aid personnel/roles pending the arrival of commanders from those sources.

AMBULANCE LIAISON OFFICER

Responsible to the Ambulance Commander.

The Ambulance Liaison Officer is required to provide a liaison point between the ambulance service and all other Emergency Service Commanders, being located with them and must have an effective communication link with the Ambulance Commander.

The liaison officer must have a good operational knowledge of the Service and be able to provide accurate information to the other Service commanders.

MEDICAL COMMANDER

Responsible to the State or Regional Controller, Health and Medical Services.

The Medical Commander will be appointed by the State Controller and will provide a forward command role for Health and Medical Services at the site.

The Medical Commander will command all medical personnel at the site to ensure the optimum utilisation of all medical resources at the site and liaise closely with the Ambulance Commander.

The Commander will provide or be responsible for:

- Health, medical and scientific advice to the other Emergency Service Commanders;
- Regular reports to the State Controller on the status of the situation;
- Ensuring adequate resources are available for the medical teams;
- Ensuring the welfare and safety of the medical teams is taken care of, including relief, sustenance and debriefing;
- Appointing or confirming the appointment of an appropriate Medical Triage Officer;
- Notifying the medical personnel at the site as to the total incident status; and
- Providing the medical input to any debrief.

MEDICAL TEAM LEADER

Responsible to the Medical Commander.

The Medical Team Leader will be responsible for the management of the medical team and medical and nursing personnel working within the site, and to ensure that they have the resources necessary to provide life saving treatment and stabilisation of casualties prior to transport. The Team Leader is required to ensure that the team is providing the service efficiently and effectively and to liaise with the Ambulance Transport Officer to ensure that patients are evacuated in an appropriate order.

MEDICAL TRIAGE OFFICER

Responsible to the Medical Commander.

The Medical Triage Officer will be located at the entrance to the Patient Treatment Post and will carry out a more detailed assessment of the injured thus providing a secondary triage of the patients as they arrive at that location. The Medical Triage Officer will record his/her finding on the triage tag and amend, if necessary, the priority of the patient.

NURSE COMMANDER

Responsible to the on-site Medical Commander

The on-site Nurse Commander will be appointed by the State Controller and will be responsible for the nursing management response at a major incident/disaster site.

SUMMARY

- A thorough understanding of these key words will ensure that the Health and Medical response is in line with the other Functional Services involved in the response to any emergency or disaster
- Communication should never be confused with communications, which is the method by which we communicate.
- The art of communication is making sure you understand what is being said or saying it in a way that the message cannot be misinterpreted.

CHAPTER 6

TRIAGE

INTRODUCTION

1. Triage is the process by which disaster casualties are sorted, prioritised, and distributed according to their need for first aid, resuscitation, emergency transportation, and definitive medical care. Triage is a continuing process which begins in the field and continues into the hospitals and involves the matching of victims' needs with available resources in order to achieve the best outcome for the greater number of casualties.

PRINCIPLE
The aim of triage is to achieve the greatest good for the greater number of casualties.

OBJECTIVE

2. The objective of triage is to minimise the death and suffering that is the result of a disaster. This is achieved by ensuring that available health resources are directed to those who will receive the greatest benefit. As a corollary, response effectiveness demands that limited resources not be applied to victims with very low (or nil) survival probability.

TIMING

3. Triage is a dynamic process, as the state of the patient may change, either as a result of injuries worsening, or because of interventions. To be effective, triage must be repeated many times, which may include:

- when the casualty is first seen;
- before movement from the incident site:;
- within the forward treatment area;
- before transportation to hospital;
- on arrival at the hospital before surgery. In addition, reassessment will be necessary; and
- whenever the casualty's condition is noted to have altered.

PRINCIPLE
Triage is the continuing process which commences on the field and continues into the hospital.

PERSONNEL

4. Accurate triage, by implication, necessitates experienced medical judgement. It should always be carried out by the most clinically skilled and experienced person present. Over the course of a disaster, the person doing triage may change from an ambulance officer to a senior medical clinician.

PRIORITIES

5. Effective triage requires the identification of different priority groups. While casualties may differ in their severity within these groups, initial sorting and treatment can at least occur. While triage categories may differ slightly between States/Countries, generally accepted categories are as follows:

- ***First Priority (Red)***—Life threatening injuries in need of urgent medical care, requiring priority transport, with or without appropriate resuscitation.
- ***Second Priority (Yellow)***—Significant injuries, condition stable and treatment can wait. Or for casualties not expected to live, or whose resuscitation may over-utilise available resources and prejudice the survival of other patients.
- ***Third Priority (Green)***—Walking wounded who may not require ambulance transport according to priorities, to treatment centres. Casualty will not require hospitalisation. Psychological casualties are included in this category.
- ***Deceased (Black/white)***—Used for the dead.

THE 'EXPECTANT' CATEGORY

6. In addition to the above categories, it is also well recognised that there are some casualties whose injuries are so severe that they either will not survive, or they will drain excessive resources to the detriment of large numbers of other casualties. These may include the following:

- Any person in cardio-respiratory arrest.
- Any person with a Glasgow Coma Score of 3 (no eye opening, no verbal or motor response)
- Major burns where age >60 years and body surface area burned >50%. As a general rule, if (age + % BSA burned) >100, mortality approaches 1.0.
- Elderly persons with shock and multiple, severe injuries (especially CNS and thoracic).

7. The decision to establish this category should be made by the senior ambulance/medical officers on site, and will depend on factors such as the level of resources available at the scene, evacuation resources (including time and distance), and the resources available in hospital. In addition, consideration needs to be given as to at what stage should such casualties be given treatment/evacuation (for example, after priority 2's but before priority 3's).

8. It is essential that all health care providers who attend the site use the same priority groups (including expectant category if required), and the same criteria for categorising casualties into these priorities.

THE PROCESS OF TRIAGE

9. Where resources allow, the assessment and management of casualties should follow the 'ABCDE' approach as outlined in the Early Management of Severe Trauma (EMST) course of the Royal Australasian College of Surgeons, and the Trauma Nursing Core Course (TNCC) of the Emergency Nursing Association. This is a system of individual assessment and concurrent management.

10. In a situation where there are an overwhelming number of casualties (ie resources do not allow), triage has to be undertaken in isolation, sorting as many casualties as possible according to need, as quickly as possible. Additional personnel then undertake appropriate resuscitation measures, treating casualties in order of assigned triage priorities.

11. In such a situation, a number of methods of rapid triage for mass casualties have been developed. In general terms, these methods usually involve rapid identification of the 'walking wounded' (Priority 3) and the deceased (Priority 4), and then use easily applied parameters to quickly sort the remaining casualties. To be effective, such methods need to be applicable in the field, related to mortality, and be easily reproducible.

12. An example of rapid triage method is the Triage Sieve/Triage Sort, as advocated by the Major Incident and Medical Management and Support (MIMMS) course of the Advanced Life Support Group, UK. This operates on the following algorithm:

Walking ?	Yes	→	'Green'	Delayed
↓				
Airway ?	No	→	'White'	Deceased
↓				
Respiratory Rate?	<10 or > 30	→	'Red'	Immediate
↓				
Capilatory Refill?	>2s (or P>120)	↗		
(Adults)	< 2s (or P<120)	→	'Orange'	Urgent

After the initial 'sieve' a more detailed 'sort' is conducted utilising the Triage Revised Trauma Score (respiratory rate, systolic blood pressure and GCS), as well as available anatomical considerations.

13. Triage tags are used to indicate the category in which the patient has been placed. The triage tag forms the initial medical record and must not be removed until admission to hospital or area of definitive care. The tag must then be incorporated into the medical record.

14. Identification of categories is likely to be most effective where at least two different methods are used ie: casualties are tagged as well as geographically co-located.

TRIAGE AT THE SITE

15. Effective triage at the site is essential to ensure that immediate treatment can be delivered to those who will most benefit from it, and so that priorities for evacuation can be readily assigned.

16. Arrangements for the management of triage at the site will generally be an ambulance responsibility and involve the establishment of a medical incident management system. Field Medical Teams will work in conjunction with ambulance and first aid personnel, under the control of the Field Medical Commander, who will liaise with the Ambulance Commander.

TRIAGE AT THE HOSPITAL

17. In many disasters a significant proportion of casualties may make their way to the nearest hospital without having been triaged at the site. Patients arriving at hospital should be triaged at the entrance to the Emergency Department by an experienced doctor/emergency nurse and then allocated to appropriate designated areas (Resuscitation, Urgent, Ambulatory).

18. Effective triage at the hospital allows for priorities to be established for resuscitation, operating theatre access, intensive care and transfer as appropriate to subspecialty areas (such as neurosurgery/spinal).

PRACTISING TRIAGE

19. Practising to triage in a mass casualty situation is difficult to totally replicate, and suffers from the usual constraints in terms of trying to simulate a ‘life or death’, pressure situation. Options may include field exercises (involving role-playing casualties), card exercises (ie utilising SIMCAS cards) or computer simulations.

SUMMARY

20. Triage is a clinical decision making process by which disaster casualties are sorted, prioritised and distributed according to their need for first aid, resuscitation, emergency transportation and definitive medical care.

21. Triage is dynamic and should commence with the first medical responder and continue through to the hospital.

22. Accurate triage is the key to ensuring that limited resources are used for maximum benefit in a mass casualty situation

23. With multiple casualties, it may be necessary to adopt a system of rapid triage. This will generally involve rapidly sorting casualties utilising mobility and identifying those casualties with poor outcomes. By necessity, this sorting is crude and to be effective needs to be regularly repeated.

REFERENCES

24. References used in this Chapter are as follows:

- Kennedy et al, Triage: **Techniques and Application in Decision Making:** Annals of Emergency Medicine 2812, August 1996, pp. 136-144
- Trauma Committee, Royal Australasian College of Surgeons, **Early Management of Severe Trauma (EMST) Course Manual.**
- The Committee on Trauma, American College of Surgeons, **Advanced Trauma Life Support (ATLS).**
- Emergency Nursing Association, **Trauma Nursing Core Course (TNCC) Manual.**
- Advanced Life Support Group, **Major Incident Medical Management and Support, the Practical Approach.**

CHAPTER 7

CLINICAL MANAGEMENT

INTRODUCTION

1. The usual principles of resuscitation and clinical management, which are applied to individual patients in the Emergency Medical System, cannot always be effectively utilised in disaster and mass casualty incidents. In these situations, circumstances will arise where the availability of clinical care will be exceeded by the cumulative medical needs of the victims. Expert triage and selective management of patients and injuries is needed, if the best overall outcome is to be achieved with the resources that are available.

OBJECTIVE

2. The objective of this Chapter is to provide guidance to medical teams and ambulance officers in areas of clinical difficulty which can arise.

RESUSCITATION

3. In general, the approach to resuscitation of multiple casualties is similar to the 'ABCDE' model of primary survey and resuscitation as advocated by the Early Management of Severe Trauma Course (EMST) of the Royal Australasian College of Surgeons, Advanced Trauma Life Support Course (ATLS) of the American College of Surgeons and Trauma Nursing Core Course (TNCC) of the Emergency Nursing Association. This treatment paradigm involves a sequential approach to the injured patient necessitating a rapid initial assessment and management of:

- airway and cervical spine care;
- breathing and oxygenation;
- circulatory support and control of haemorrhage;
- rapid neurological assessment; and
- exposure to permit examination and treatment.

4. Life-threatening conditions may be treated as they are found, according to the availability of expertise and equipment and having regard to the overall circumstances. In mass casualty situations, this approach is useful in making triage and clinical management decisions. For example, patients with airway and breathing difficulties are treated before patients with extremity fractures. However, clinical resource limitations may require modification of the approach.

AIRWAY MANAGEMENT

5. In dealing with a lone, severely traumatised patient, medical resuscitation teams will invariably adopt an aggressive approach to airway management, performing endotracheal intubation early so as to protect the airway and optimise oxygenation, especially in patients who are comatose. However, in the multi-casualty situation, consideration must be given to the resource implications of intubating patients both in terms of the time taken to undertake the procedure and the usual requirement for someone skilled to continue with ventilatory assistance. Important considerations are detailed below.

Equipment

6. Medical Teams attending disasters and multi casualty incidents should have special field kits carefully assembled in advance, checked regularly, and again when preparing for a special mission. These kits should include airway management equipment (including surgical airway kit). Disaster plans should determine whether medical teams or the ambulance provide oxygen delivery systems and portable suction.

7. It should be noted that while laryngosopes can be used in outside, daylight areas, they are more effective when used indoors, or in conditions where temporary shadow can be created. A frequent problem noted by hospital medical staff during intubation is the lack of unlimited, adequate suction to clear the airway in a field situation.

Muscle Relaxants

8. Muscle relaxants (eg suxamethonium, vecuronium, or rocuronium) should never be used without first ensuring that ordinary bag and mask ventilation is possible, and the intubator is experienced and confident of success. A failed intubation routine is essential.

9. The use of depolarising relaxants is relatively contra-indicated in patients with severe crush injuries, or burns.

Sedatives

10. Short-acting narcotics (eg fentanyl) and benzodiazepines (eg midazolam) are favoured by some authors for field co-induction. Medical team kits should include reversal agents (Naloxone and Flumazenil).

11. Ketamine may be useful for induction and maintenance of anaesthesia, especially if combined with prior administration benzodiazepine.

12. Avoid the use of routine or standard doses of sodium thiopentone because of the serious risk of precipitating shock in patients with unrecognised hypovolaemia.

ANALGESIA

13. The relief of pain is a high priority. Small doses of intravenous narcotics should be used and titrated to response. Consider the use of nerve blocks for regional anaesthesia.

Immobilise Fractures and Cover Burns

14. In some circumstances, for example during difficult extrications, special techniques such as nerve blocks may be usefully employed by appropriately skilled teams.

BURNS

15. Mass burns present major logistical difficulties. Most dedicated Burns Units operate at maximum occupancy and there is no excess capacity to absorb large numbers of additional patients. Therefore mass burns should usually be distributed between available receiving hospitals initially so as to ensure optimal early resuscitation.

16. As the extent of the disaster becomes known, decisions can be taken as to whether the on-going burns care is centralised in special facilities created to deal with the emergency (usual strategy), or is decentralised.

Burns Resuscitation

17. Field priorities include the removal of burned clothing, cooling of burned tissue, oxygen therapy, covering of burns with clean dressings, establishment of IV access, volume resuscitation with N/Saline/Haemaccel, and titrated IV analgesia, wherever possible. Victims with respiratory burns should be prioritised for early evacuation to hospital because of the risks of insidious and progressive airway obstruction.

CARBON MONOXIDE POISONING

18. Casualties from enclosed space fires may suffer carbon monoxide poisoning. Patients with significant CO poisoning are ideally treated with hyperbaric oxygen (HBO), Treatment with higher flows of 100 per cent oxygen using a non-rebreathing circuit is often perfectly satisfactory.

Exposure

19. Any casualty of a fire disaster suffering dizziness, weakness, incoordination, headache, nausea and vomiting, eye or mucus membrane irritation, or who has any history of loss of consciousness or dyspnoea, should be transported to hospital for assessment.

HYPOTHERMIA

20. Victims of disasters occurring in cold environments may suffer secondary injury from hypothermia. Remove wet clothing, wrap in blankets and protect from the wind whilst awaiting transport. Depending on resources, it may be reasonable to perform CPR on hypothermic victims without vital signs and with no obvious lethal injury, whilst rewarming.

CRUSH INJURY

21. In earthquakes, cyclones, building collapse, victims with crush injury may be encountered. Priorities include rapid extrication and IV fluid resuscitation. If a victim has been crushed for a prolonged period, Medical Teams should consider premedication with bicarbonate and calcium chloride (to counteract hyperkalaemia) immediately prior to extrication.

22. Forced alkaline diuresis may reduce the incidence of renal failure and the requirements for surgical treatment of marginal compartment syndromes.

WOUNDS

23. The management of most soft tissue injuries can be delayed, but haemorrhage control should be effected through direct pressure. In mangling limb injuries and amputations, tourniquets may be used if direct pressure fails, and in severe scalp injuries, a ‘cobbling’ suture may be required to stem the bleeding. **Remember** that wounds not observed to be bleeding initially may recommence haemorrhage as blood pressure rises with resuscitation.

24. Wounds older than 6 hours, and grossly contaminated wounds should be irrigated, cleaned, debrided and left open for delayed primary closure at 48–72 hours.

25. In disasters, it is advisable to give all patients with wounds a booster vaccination against tetanus.

FRACTURES/DISLOCATIONS

26. Ensure that all fractures are splinted so as to minimise pain, reduce haemorrhage and the risk of neurovascular damage. Reduce dislocations as soon as possible. Definitive treatment of most closed fractures can be deferred for 24–48 hours if necessary, provided that they have been correctly splinted.

CHILDREN

27. Paediatric disaster victims require special care if long term medical and neuropsychiatric sequelae are to be avoided. A calm reassuring approach is imperative. Fluid resuscitation and drug dosages should be carefully calculated, based on the child's estimated weight. (Site Medical Teams should carry laminated reference cards with paediatric weight tables and drug doses).

28. Children with severe injuries should be triaged to a paediatric tertiary referral centre if this is an option, but all hospital emergency departments should be able to receive and resuscitate children. Where possible, care should be taken not to overload any centres.

RADIATION INJURY

29. Significant numbers of casualties arising from radiation exposure are not common. Special plans involving trained personnel should be in place to deal with identified risks and decontamination procedures. (Please also refer to Chapter 17 for additional details.)

Ionising Radiation Exposure

30. Casualties who have been exposed to ionising radiation, but who are not contaminated with radioactive materials, or have been decontaminated, pose no risk to health workers.

General Procedure

31. Medical Teams may not be required in the field. It should be noted that:

- the medical management of a victim with serious trauma takes precedence over treatment for radiation exposure or radioactive contamination, as these are never immediately life-threatening; and
- nasal, mouth and wound swabs should be taken as soon as possible after the exposure, to assist in determining the extent of contamination.

32. Hospital protocols should include the preparation of an isolated reception area, with barrier nursing and contamination control, and early communication with health physicists and nuclear medicine specialists.

CHEMICAL INJURY

33. Medical Teams managing victims of hazardous chemical incidents must first ensure they do not become victims themselves by failing to ensure the treatment area is safe, or by failing to take adequate precautions against contamination during patient treatment. (Please also refer to Chapter 17 for additional details.)

Management Priorities

34. These include:

- removal of contaminated clothing and decontamination of exposed skin (NB. Medical Team to wear protective gloves and clothing for the task);
- continuous copious irrigation of eyes, mucus membranes and skin if chemical burns from acid or alkali;
- basic and Advanced life support as necessary; and
- administration of specific antidotes, if available.

35. Specific management of identified chemical injuries should be obtained from Hazardous Chemical Units, Poison Information Centres, large Emergency Departments, and other authorities.

36. Care must also be taken to suitably contain all contaminated clothing, equipment and irrigation water, and that it is correctly disposed of to ensure the contamination is not spread further within the facility.

SUMMARY

37. Principles of resuscitation and management need to be adapted in disasters.

38. Expert triage and selective management of patients is required.

39. Consider resource implications before undertaking aggressive resuscitation.

40. Ensure medical team members do not become victims themselves by failing to ensure the treatment area is safe.

CHAPTER 8

TRANSPORT

INTRODUCTION

1. Prompt transport of patients will invariably be required in disasters other than those in which there are no survivors. As with all disaster responses, this function will be dependent on the type of disaster, its location and available resources. The type of disaster and prevailing weather conditions may make transport difficult. For example, flooding, earthquakes or landslides may restrict ground access whilst large bushfires, cyclones and other storms may limit air or sea operations. The distance of the disaster site from major population centres and the resources available will be modifying influences. Usual medical transport services may themselves be inhibited by the disaster.

2. Transport of patients to Collecting Areas and Patient Treatment Posts will normally be accomplished by rescue personnel using manually handled stretchers. Patients may then be further transported to other field treatment facilities or intermediate staging areas located at some distance, prior to transport to a definitive treatment location such as a regional or major teaching hospital.

3. This Chapter will cover **why**, **when**, **where** and **how** patients are transported.

PRINCIPLE
Transport should deliver the right patients, to the right place, at the right time, by the right means.

WHY?

4. Patients require transport to remove them from danger, environmental exposure, and to allow definitive diagnosis and treatment.

Caution Prior to Discharge

5. It may be possible to discharge the uninjured or those with minor problems direct from the site. This however should only occur as a last resort, unless a casualty actually refuses ambulance transport to hospital. Caution is needed so that injuries are not missed in the often less than adequate facilities for examining casualties on site. In radiation and toxic chemical incidents, symptoms may not be evident for some hours after exposure. Records must be kept of all those seen but not transported to other health facilities to enable follow-up.

6. Whilst patients with minimal injuries can often be dispatched more easily, it is necessary to ensure that receiving facilities are not flooded with low priority cases (that have already had some medical assessment at the site), prior to arrival of the critically ill. Casualties travelling by their own means or with

unregulated volunteers have been cited as overwhelming hospitals trying to deal with serious cases. (Auf Der Heide, 1989)

WHEN?

Injury Priorities

7. Patients with serious but treatable injuries will normally be the first priority for transport by ambulance vehicles once essential resuscitation measures have been undertaken. These priorities will be decided jointly by the medical officer supervising the Patient Treatment Post (Medical Team Leader) in consultation with the Ambulance Transport Officer or Ambulance Commander. Also *see* Chapter 6 on Triage.

8. Individuals with less severe injuries will normally be transported at a later time or by means other than ambulance.

WHERE?

Patient Distribution/Regulation

9. Patient distribution and regulation can be defined as the process by which:

- patients are evacuated to appropriate treatment facilities;
- patients are distributed, where possible, between treatment facilities; and
- an endeavour is made to prevent any one facility from being overwhelmed.

10. Effective patient distribution and regulation should:

- decrease the number of times a patient is handled between time of injury and reaching definitive care;
- prevent unnecessary transfer of patients between hospitals;
- be controlled with consideration for the distances involved, time critical requirements and available resources; and
- prevent any unnecessary delays in ambulance turnaround times.

11. Lesser priority patients may be regulated and sent to appropriate institutions further away from the incident site, in order to minimise the impact on hospitals that are likely to receive higher priority patients in the first instance. This is provided that transport resources are available and the transport is clinically acceptable for the patient's condition. Some consideration should also be given to keeping family members together when possible.

12. It would also be feasible, particularly in large urban areas, to consider transporting more seriously injured patients to appropriate level receiving hospitals that are nearby, but are not necessarily the closest major hospital to the incident.

13. The final destinations of patients will be decided by the on-site Field Medical Commander, in consultation with the Ambulance Commander and any Medical

Commander at a distant Control Centre. This decision making process will also include consultation with proposed receiving hospitals.

PRINCIPLE
Distribute patients widely to prevent single institutions from becoming overwhelmed whilst others are under utilised.

HOW?

Coordination

14. Where possible, patients should be transported by those services who would normally do so. This is to ensure optimal patient care and to maintain control and coordination of transport.

PRINCIPLE
Where possible, patients should be transported by those services which would normally do so.

15. Coordination of the **total** medical transport effort must be the responsibility of the Ambulance Service.

16. Other emergency vehicles and seconded forms of transport may need to be considered, and are also the responsibility of the Ambulance Service.

PRINCIPLE
All forms of patient transport need to be regulated as to where and when patients are carried.

Modes of Transport

17. The range of transport modes includes:

- manual handling;
- road ambulances;
- other emergency vehicles;
- private road vehicles;
- flood rescue boats;
- small and larger vessels;
- helicopters;
- fixed-wing aircraft; and
- vehicles of opportunity—buses, trucks, trains, etc.

Road Ambulances

18. The most appropriate method of patient transport must be used where possible. Air, water and other forms of transport may be necessary, however, it is to be expected that ground transport will be used at some stage, therefore, coordination is essential.

19. Appropriate marshalling and parking of all vehicles is necessary to ensure access to the site is not impaired. A separate Ambulance Holding Point may be required which is distant to the Ambulance Loading Point located adjacent to the Patient Treatment Post. Flow-through loading of casualties is desirable if at all possible.

Helicopters

20. Helicopters have some advantages in rescue from water or difficult terrain and can provide rapid transport over intermediate distances (up to 150 kilometres). However, there are also limitations in the number of patients which can be carried and problems due to the noisy and confined working area. They should be reserved for rescue, rapid transport of special services to a site, and medical transport of patients where there are sound clinical indications. Designated controlled landing points need to be established.

Fixed-Wing Aircraft

21. In remote areas of Australia, fixed-wing aircraft may also form part of an initial response. However, in most instances they will be part of a secondary transport system bringing in additional resources and transporting patients to distant centres.

22. Fixed-wing aircraft require suitable landing areas of a minimum length and dimensions. These are usually at some distance from the centre of operations so transport to and from the landing area will also be required, and may include road ambulances or helicopters.

23. Fixed-wing aircraft have advantages of speed and range which make them appropriate for patients requiring transport over longer distances.

Pre-flight Patient Stabilisation

24. Where practicable the advice of a person with aviation medicine expertise should be sought on the requirement for pre-flight stabilisation.

Clinical Effects of Flight

25. Air transport has implications for certain types of injuries. In-flight clinical considerations include problems relating to changes in barometric pressure and altered partial pressure of inspired oxygen, but also include practical considerations of noise, vibration and turbulence and cramped working conditions. Clinical effects should be well known by the medical transport organisations routinely using aircraft. Where consideration is given to seconding other aircraft, medical advice must be sought on appropriateness of air transport.

GENERAL

Basic Requirements

26. Patient transport vehicles should, where possible, be suitable for the purpose. Some considerations are:

- the ability to traverse the terrain and distances to be travelled;
- equipped if possible with at least basic resuscitation equipment including oxygen, suction, airway aids and a method for assisted ventilation;
- adequate lighting and temperature control;
- suitable stretchers and restraint systems;
- reasonable comfort for passengers and attendants; and
- an appropriate means of communication.

27. Utilisation of appropriate methods of transport will prevent exacerbation of injuries, unobserved deterioration in the condition of patients, and a lesser level of care being provided than existed at the scene. Normally the better methods of transport available should be utilised for the most serious cases.

28. Transport resources should be used to their best advantage. This may include transport of sitting patients in addition to a full complement of stretcher cases on each journey.

Improvisation

29. Vehicles of opportunity may be used with appropriate improvisation. This will depend on the transport resources available and the ingenuity of those involved. For example, buses have the capacity to remove large numbers of victims with only minor injuries from the centre of operations, or can be outfitted with stretchers for a lesser number of patients. Trucks and watercraft can also be used in appropriate circumstances.

Infectious Diseases

30. Certain disasters may be associated with casualties suffering from infectious diseases. These cases can normally be safely managed during transport by adherence to universal precautions. Containment systems, designed for viral haemorrhagic fevers, are no longer regarded as necessary for air or ground transport.

Hazardous Materials

31. Patients involved in hazardous materials incidents pose a risk to transport personnel. Expert advice should be sought prior to handling the patient, on the type of protection required and the type of decontamination required for the patient, crew and vehicle. It is imperative that the contaminant is not spread any further than can be prevented.

Personnel

32. Patients should be attended by appropriately trained persons and some form of observation, monitoring and documentation undertaken during the journey.

33. Doctors and nurses may be used to accompany the critically ill where resources allow; that is, there are sufficient staff already on site, or additional medical teams are brought in.

34. For seriously ill patients, it is normally the quality of clinical care available during transport, not the actual mode of transport which is important.

PRINCIPLE
The quality of patient care during transport is usually more important than the mode of transport.

35. Standards for inter-hospital transport of patients have recently been formulated. These provide a guide to optimal standards of patient care, but during disasters some degree of compromise may be necessary. (ANZCA & ACEM, 1991)

Documentation

36. Patients should be accompanied by documentation to assist the receiving institution. This should indicate:

- triage category;
- how the injury occurred;
- clinical assessment and time;
- treatment given; and
- personal details (wherever possible).

37. This documentation will be a triage tag or more detailed clinical assessment sheets where available. See also Chapter 19 on Documentation.

Deceased Persons

38. Transport of the deceased to temporary or permanent mortuaries can pose significant logistic problems. The transport of living patients must take priority over movement of the deceased. See also Chapter 22 on Management of Deceased.

SUMMARY

39. The patient transport needs of persons affected by disasters will differ in many cases, to day to day patient transport needs. Transport Control Officers and Medical Coordinators will need to ensure that they cater for the needs of the individual, while at the same time maximising the use of transport resources available to them.

40. A key component of transport resource maximisation, revolves around timely and appropriate patient distribution and regulation. Avoiding initial transportation of patients that will likely lead to secondary transport at a later time, is in the best interests of both the patient and the 'in field' medical personnel.

41. Constant liaison between Ambulance Commanders and Medical Coordinators will ensure the best possible use of available transport resources.

42. Early consideration should be given to accessing alternative modes of transport, eg buses, trucks etc, where the appropriateness of such will meet the needs of the patients.

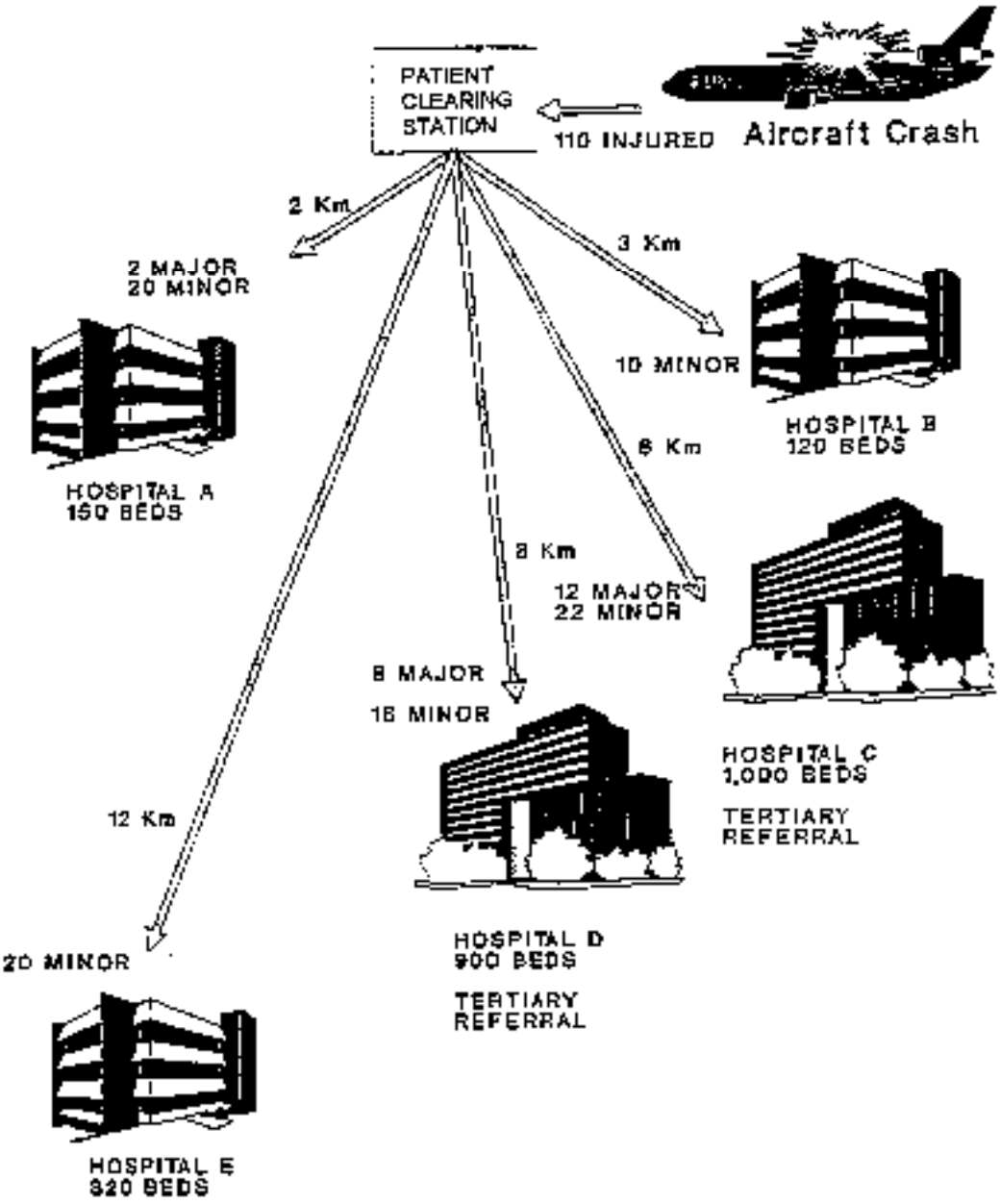
REFERENCES

- Auf Der Heide, Erik: **Disaster Response: Principles of Preparation and Coordination.** St Louis: CV Mosby, 1989, ISBN 0 8016 0385 4

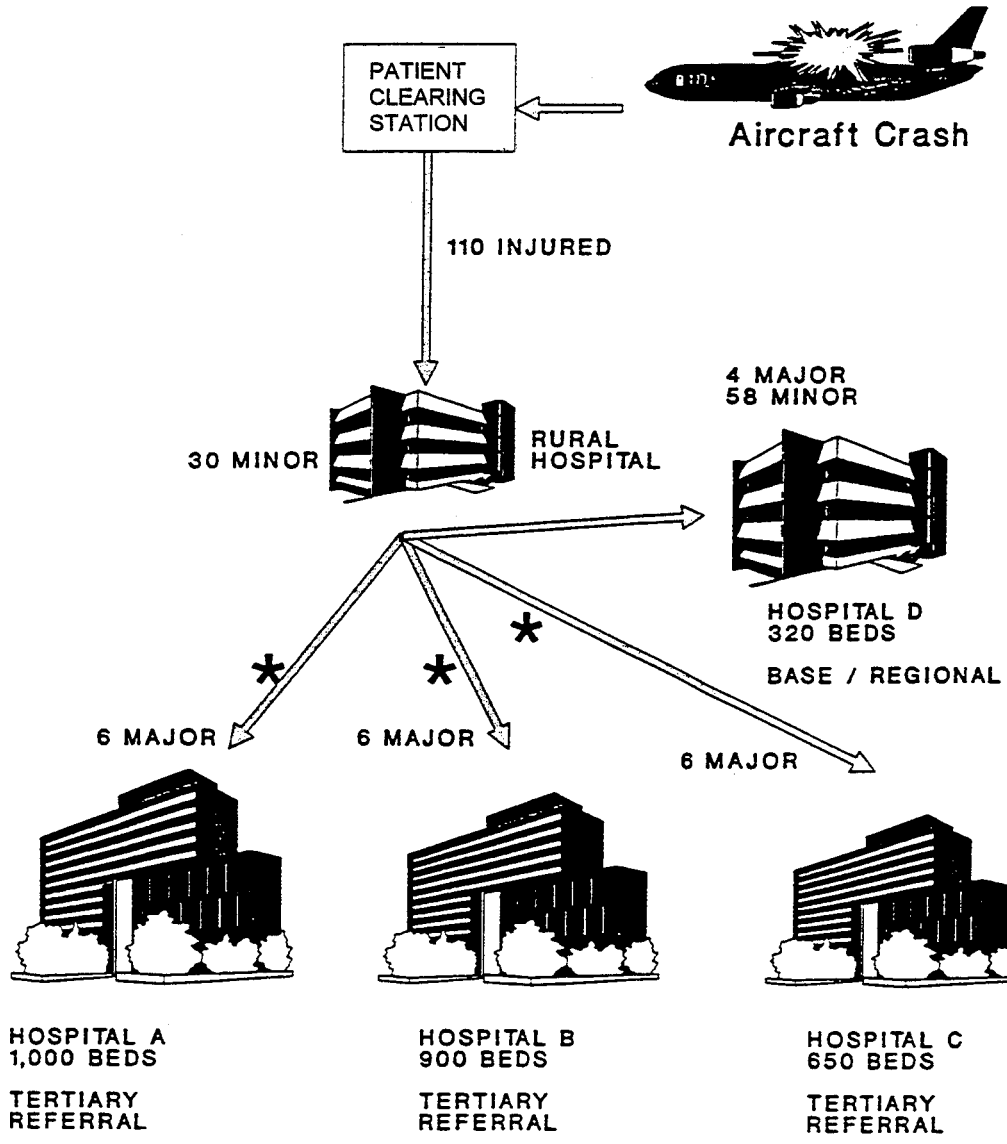
- Australian & New Zealand College of Anaesthetists and Australasian College for Emergency Medicine: **Joint Policy on Inter-hospital Transport of Patients.** 1991

Annexes:
A. Triage—Patient Distribution Urban Model
B. Triage—Patient Distribution Rural Model

TRIAGE—PATIENT DISTRIBUTION URBAN MODEL



TRIAGE—PATIENT DISTRIBUTION RURAL MODEL



CHAPTER 9

HOSPITAL DISASTER PLANNING

INTRODUCTION

1. Disasters may produce casualties on such a scale that a significant overload is placed on existing medical, hospital and healthcare facilities, to the extent that the facilities often need expanding to cope with the added increase in workload.

2. It is essential for hospitals in particular, to have up-to-date, prepared and rehearsed plans and procedures, integrated with the community Disaster Response Plans, to provide effective response when needed to cope with mass casualties in major incident and disaster situations.

3. Planning will need to identify the potential effect upon a hospital that is the sole source from which external medical teams are provided.

HOSPITAL PLANNING NEEDS

4. All hospitals must have an emergency plan providing for the following:

- ***An Internal Emergency Affecting the Hospital Itself***—Internal emergencies relate to hospital based incidents such as fire, bomb-threat, technological, industrial, gas leaks, structural damage, industrial, technological etc. Plans for emergency evacuation of the facility, and mutual aid arrangements for the care of patients are an essential element of a hospital's daily emergency procedures and planning. Such planning may involve the response by other emergency services and medical and health agencies, together with various auxiliaries, and needs to be integrated with local community authorities; and

- ***An External Disaster where Casualties are Directed to the Hospital for Definitive Treatment and Care***—In the case of external disasters where casualties may be directed to the hospital with little or no warning, an effective response may well depend on the soundness and testing of the External Disaster Plan and the extent of training of staff required to provide such response.

COPING WITH DISASTER

5. To be able to cope with a mass casualty situation, hospitals must be prepared to accept casualties far in excess of what occurs in normal circumstances. In this context, with facilities and staff being stretched to the limit, and often being overwhelmed, strict priorities for treatment and management of casualties are necessary. Until the hospital routine and the situation resumes normality, often basic patient care only can be provided rather than the standard care usually available to patients.

HOSPITAL ROLES IN DISASTER

6. Apart from the requirement for a hospital to plan for internal emergencies and external disasters and emergencies on an individual basis, such planning will need to address any special disaster roles given to the hospital under Regional or State Disaster Plans.

7. In a metropolitan area where multiple resources exist, a major hospital may well be a designated hospital to:

- provide trained Field Medical Teams to work at a disaster site;
- act as a receiving hospital for casualties transferred from a disaster site;
- receive patients transferred from other hospitals where bed space is required by a receiving hospital for the admission of urgent cases; and
- act as a triage hospital in extreme mass casualty conditions.

FIELD MEDICAL TEAMS

8. Nominated hospitals must provide Medical Teams when requested. Hospitals must notify the Disaster Medical Control Centre or Regional Ambulance Coordination Centre of the names and designations of all team members on departure from the hospital. A Medical Team consists of registered doctors and nurses, with appropriate experience, one of whom will be appointed as Team Leader. It is the responsibility of hospitals to select their most suitable staff for their Medical Teams. Larger hospitals may be requested to provide Teams which include surgeons and anaesthetists.

9. Such a team needs to be properly equipped with identification, appropriate protective clothing, disaster medical supplies, communications, and trained in medical disaster management, as they will be working with other structured emergency services. *See* Chapter 15 on Personal Equipment and Identification for a more comprehensive listing of appropriate items.

TRANSPORT OF TEAMS AND EQUIPMENT

10. Responsibility for the transport of Medical Teams and equipment to disaster sites should be pre-determined.

HOSPITAL RESPONSE TIME

11. What is not always realised, particularly by other responding emergency services and community groups, is that a considerable effort must be made by a hospital to re-arrange treatment or other care facilities to cope with an abnormal number of casualties presenting. With this fact in mind, it is essential that planning and practising of plans and the training and exercising of staff in disaster procedures should be carried out and integrated with all medical responders and participating emergency services.

Plan Format

12. The hospital plan should include:

- authority signed jointly by the participating organisations;
- aim of the plan;
- scope of the plan;
- activation of the plan;
- location of the Control Centre together with an alternative;
- key personnel, their authority, roles and responsibilities;
- specific roles and responsibilities of the participating organisations;
- principle of the operation;
- phases of the activation;
- review of the plan;
- distribution of the plan;
- exercise of the plan;
- annexes which include specific operational procedures, chain of command, duty statements, personnel and means of contact, resources and debrief procedures; and
- date of issue (on every page).

13. Two enhancements which are recommended for all the plans are:

- identify incident/disaster response in phases and stages so that the plan defines a procedure which will coordinate the responses of each of the

participating organisations in an escalating manner, where possible, or at least in a controlled manner in the event of an impact incident; and

- divide the service or organisation into sub-groups according to their particular expertise or function so that all personnel can be trained to their specific role eg communications, administration and welfare, supply and engineering.

PLANNING CONSIDERATIONS

14. For a casualty situation with the potential to overwhelm normal resources, the following issues must be addressed:

- ***Planning Committee***—The establishment of a Hospital Disaster Planning Committee and a representative member to attend the Local/Regional Disaster Planning Committee to ensure planning is not done in isolation and can be integrated with other emergency response required (*see* Annex A to this Chapter for further details).

- ***Authorisation***—Identify the positions authorised to place the hospital in a disaster mode:
  - Where a hospital has an established Emergency Department, initial notification of casualties may be communicated directly to the Department. In these circumstances, if the plan is to be activated such communications should be switched through to the Hospital Control Room when established, as emergency staff will be fully occupied in treatment procedures.
  - In other circumstances, the Hospital Administrator or delegate might well be the appropriate person for initial contact and for the activation of the hospital to the desired level of disaster response.

- ***Activation***—The hospital must provide a framework plan to activate a hospital disaster organisational structure to manage the situation and to develop procedures for staff/medical specialist alerting and mobilisation for assigned duties and other administrative matters. This includes maintenance of an up-to-date record of contact points.

- ***Roles***—Designation of a Hospital Controller and key personnel with Action Cards showing procedures and assigned duties. Key staff given particular roles in an emergency should have suitable identity such as tabards eg Triage Officer/Nurse.

- ***Liaison***—A liaison officer must be up to date with accurate information on the status of various treatment areas of the hospital and the arrangements in place for the operation/ administration of the hospital and be able to provide regular situation reports on the disaster response as requested.

- ***Alert***—Maintenance of an up-to-date system to contact, alert and call out necessary medical and other staff required.

- ***Rostering***—Consider alternative rostering practices to maximise resources. **To avoid fatigue, all staff should be relieved at regular intervals**.

- ***Volunteers***—Hospitals must maintain up to date contact lists of regular hospital volunteer personnel, which may be used to supplement and assist hospital staff. All volunteers, self activating or requested, must report to the hospital for registration and tasking, and will work under the direct supervision of designated hospital staff.

- ***Hospital Control Centre***—A Hospital Control Room with dedicated silent number telephone, facsimile, television and other communication needs to be designated and established (*see* Annex C to this Chapter).

- ***Telephone Access***—Silent telephone lines enable the Hospital Control Group to effectively communicate without undue delays.

- ***Alternative Communications***—The knowledge of how to obtain these, such as messenger system, clinic car with radio, other radio emergency networks, should communications fail.

- ***Treatment Areas***—These must be defined with arrangements shown for triage, resuscitation, casualty holding areas including areas designated for treating minor wounded.

- ***Walking Wounded***—Establishment of treatment areas in the hospital to handle minor injuries not requiring hospital admission. (This is most important as it keeps the Emergency Department clear for admission of urgent cases).

- ***Normal Function***—The hospital may still receive patients other than those involved in the disaster, and provision must be made to triage these patients and manage them appropriately.

- ***Additional Resources***—The hospital controller may request additional medical teams to assist in the management of casualties. These teams should work under the direction of the hospital controller.

- ***Inpatient Medical Assessment***—For the transfer of ward patients to other areas of the hospital, or to other healthcare centres as appropriate, or temporarily discharged to their homes, if beds are required for admission of serious casualties. It is desirable for all disaster casualties to be kept in designated wards due to the special requirements and documentation required following treatment and care.

- ***Bed Management***—Arrangements necessary to provide for expanded wards, supplemented by beds and stretchers.

- ***Rescheduling***—Existing elective surgery and other medical appointments and rearranging existing out-patient services.

- ***Continuing Care***—Arrangements for auxiliary hospital staff to care for persons temporarily transferred from ward areas and to ensure that comfort and meals are provided to existing patients.

- ***Documentation***—Establishment of a Hospital Disaster Registration System for casualties, including provision for documenting hospital inpatients who reside in the impact area.

- ***Triage Tags***—Casualties arriving at the hospital processed with triage tags showing treatment received, should have the tags integrated into the pre-prepared hospital disaster documentation.

- ***Building Plans***—Provide building plans to show the anticipated rearranged treatment areas for mass casualties and facilities for next of kin and the media.

- ***Security***—Security staff required to handle the increased internal hospital security matters and to provide transport vehicle control at the hospital to allow clear entry for ambulances and other authorised emergency vehicles.

- ***Utilities***—Arrangements to provide auxiliary power and essential supplies of water, gases, fuels to ensure the hospital can continue operating under adverse conditions. Consideration should also be given to additional catering requirements.

- ***Identification***—The provision of tabards or armbands to identify persons carrying out an assigned role under the plan is most useful, particularly if they are not performing usual tasks.

- ***Revision***—Review of the plan at regular intervals or following testing or activation of the plan where improvements can be made or deficiencies are found. Contact numbers for key staff may best be kept in an annex to the main plan so that updating of changes can be made as they occur.

TRAINING

15. It is essential that training is carried out as a continuing process for all personnel who will be required to participate in a response to a major incident/disaster.

16. This training must include all aspects of the health and medical response such as the first responders' role, initial medical site management, the liaison with other services, and an understanding of the overall picture of the State response to disasters.

17. Exercises can be carried out 'in-house'. However, where possible exercises should be multi-agency to enable a sense of realism and practical experience in managing a response. (*See* Annex D to this Chapter for further details.)

18. For details on Training and Exercises, *see also* Chapter 20.

REVIEW AND MAINTENANCE

19. Any plan that is written is never really complete since resources, technology and personnel change as time progresses. In addition, experience may reveal better response strategies. Therefore a counter disaster planner should be committed to the role, by a hospital, to provide for reviewing, amending and maintaining the plan which has been initially prepared.

20. This also provides a central point for contact in the counter disaster arena which should ensure better liaison with other agencies prior to the response—it is far better to be able to identify a friendly face in planning for and response to emergencies.

PRINCIPLE
Those who work together well on a daily basis tend to work together well in a disaster.

PRIVATE HOSPITALS

Disaster Role

21. The role of private hospitals in external disasters is primarily to accommodate patients transferred from casualty receiving public hospitals. Some private hospitals may have the capacity to receive casualties and these facilities should be identified in Regional or State medical disaster plans.

Disaster Plans

22. Private hospitals are required to have plans to deal with internal disasters, as well as provide for their participation in the response to external disasters when requested by the State Controller.

SUMMARY

23. Hospitals need to plan for both internal emergencies (such as fire, etc) as well as external disasters (such as bus crashes).

24. Up-to-date and well-rehearsed plans, integrated with community plans, provide and effective response to cope with casualties from disaster situations.

25. Training for hospital personnel should focus on both testing and familiarising personnel with plans, as well as developing individual's performance capabilities.

REFERENCES

26. References used in this Chapter are as follows:

- Australian Standards, AS 4083 **Emergency Responses for Health Care Facilities**.

- Auf der Heide, E., **Community Medical Disaster Planning and Evaluation Guide: an interrogatory format**, American College of Physicians, 1995, Dallas, Texas.
- Doyle, C.J., **Mass Casualty Incidents – Integration with Pre Hospital Care**:, Emergency Medicine Clinics of North America – Vol 8, No 1, Feb 1990, pp. 163–175.
- Waeckerle, J.F., **Disaster Planning and Response**, New England Journal of Medicine, Vol 324, No 12, 21/3 1991, pp. 815–821.

Annexes:

A. Guidelines for a Hospital Disaster Planning Committee
B. Checklist for a Hospital Disaster Plan
C. Hospital Control Centre Arrangements
D. How to conduct a simple Hospital Disaster Exercise

GUIDELINES FOR A HOSPITAL DISASTER PLANNING COMMITTEE

Membership

1. The following list is suggested:

- Hospital controller and alternates.
- Hospital fire/safety officer.
- Emergency Department—medical and nursing.
- Representative after-hours coordinator.
- Senior Nursing representative.
- Business Manager.
- Environmental Services representative (including porters/ catering/ cleaning).
- Pathology (including blood products supply).
- Pharmacy.
- Ambulance service.
- Media Liaison.
- Other ward/department representatives, especially where that ward or department has a significant role (ie casualty receiving ward).
- Social work department.
- Mental health services.
- May also need to consider other groups, such as local GP's/ Division of practice/collocated private hospitals, depending on circumstance.

Reporting Lines

2. These should be:

- to overall hospital management committee (or equivalent); and
- to area medical/health coordinator via area medical/health disaster planning committee.

Frequency of Meetings

3. Meetings should be held on a monthly basis, or more often in relation to the conduct of exercises or actual incidents. Minutes should be recorded, disseminated and centrally filed.

Terms of Reference

4. These should include:

- to develop, review and revise the hospital arrangements for managing both internal and external emergencies and disasters;
- to arrange for the conduct of a hospital disaster exercise on at least a yearly basis;
- to advise the hospital management committee on the state of preparedness of the hospital to manage an internal emergency/external disaster, and the resource implications of such;
- to provide advice on the training of staff to enable them to respond to such events;
- to provide to the area medical/health coordinator as to the capability and arrangements of the hospital with regard to participating in an area response to a disaster; and
- to liaise with external health care providers with regard to overall coordination of care/ resources.

FACILITY/HOSPITAL DISASTER PLAN CHECK LIST (NEW SOUTH WALES HEALTH EXAMPLE)

Emergency management for health care facilities includes elements of prevention, preparedness, response and recovery. The objective of this paper is to present matters for consideration to assist health care facilities in effective planning for both internal and external emergencies. These plans should take into account such factors as the appropriateness and adequacy of physical facilities, organisational structures, human resources and communication systems.

BASIC CONSIDERATIONS

1. Consider these questions:

- Does the hospital have a disaster plan?
- Has a hospital disaster planning committee been appointed and does the hospital disaster planning committee have the authority to carry out their mandate?
- Does the plan detail actions to be taken for both internal and external disasters?
- Does the plan detail how it links with the Area Health Services HEALTHPLAN and, if appropriate, the local Emergency Management DISPLAN?
- Does the plan detail the position holder responsible to issue situation reports?
- Is the plan widely distributed and freely available throughout the hospital?

IDENTIFICATION OF AUTHORISED PERSONNEL

2. Consider these questions:

- Has the hospital provided, on a 24 hour per day basis, a Hospital Disaster Controller who will receive/give the initial notification, from/to the Area HSFAC, that the hospital could be/is involved in a major incident/disaster and who will assume the overall command of the hospital and general resources during the time the hospital plan is activated, be it for an internal disaster or as a response to an external disaster?
- Has the hospital provided a Hospital Medical Commander who will be responsible for the hospital's medical responses during the time the plan is activated?
- Have other key position holders who have a role in disaster management been identified?
- Is an appropriate notification system to alert personnel to a potential situation in place?

- Does the plan include lines of authority, role responsibilities and provide for succession?
- Are those who are expected to implement and use the plan familiar with it?
- Are disaster roles and responsibilities assigned in terms of positions rather than individuals?
- Have role cards been developed for all personnel involved in disaster response?
- Does the plan designate how people will be identified within the hospital e.g. hospital staff, outside supporting medical personnel, news media, clergy, visitors, etc?
- Do the staff have the proper identification to gain access to the hospital when called back on duty?
- Is there designation of assembly points for all personnel to report to, be they hospital staff or participating organisation staff?

ACTIVATION OF THE PLAN

3. Consider these questions:

- Does the plan specify the circumstances for which the plan can be activated?
- Does the plan stipulate the position holder who has the authority to activate/ deactivate the plan including during the quiet hours, weekend and holidays?
- Have activation stages been identified in the plan and roles outlined with each? The stages are as follows:

Alert	Disaster situation possible: there is an increased level of preparedness.
Stand-By	Disaster situation probable: available for immediate deployment.
Call-Out	Disaster situation exists: there is deployment.
Stand-Down	Disaster situation is contained.

ALERTING SYSTEM

4. Consider these questions:

- Does the plan provide for the prompt activation of the plan during normal and quiet hours including weekends and holidays?

- Does the plan specify how notification within the hospital will be carried out?
- Does the plan specify the chain of command to notify internal and other appropriate hospital staff of the hospital's status,?
- Does the plan detail responsibility to initiate a system for recalling staff back to duty?
- Does the plan provide for an alternative system(s) of notification which considers people, equipment and procedures?

RESPONSE

5. Consider these questions:

- Has the hospital developed internal plans for internal emergencies?
- Has the hospital developed internal plans to respond an external disaster. Does this plan indicate how the hospital will respond to an abnormally large influx of patients?
- Has the hospital developed plans indicating how the hospital will be able to supply resources and personnel to an external disaster?
- Does the plan include a chemical hazard, biological hazard or radiological hazard component?
- Has provision been made for activating the hospital disaster medical team in response to both internal and external disasters?
- Does the plan include procedures for incorporating and managing volunteers and unexpected medical services responders who want to help?
- Has each department developed standard operating procedures to reflect how it will provide its services in a timely 24 hours manner? Such departments may include the following:
  - Administration
  - Emergency
  - Nursing
  - Radiology
  - Laboratory
  - Pharmacy
  - Critical care
  - Central supply
  - Maintenance and Engineering
  - Security

  - Dietetics
  - Housekeeping and Laundry
  - Social and Pastoral
  - Mortuary

- In the Emergency Department section of the plan consider the following details:
  - Is there a separate entry to the Emergency Department for contaminated patients?
  - Is there a dedicated facility for decontamination or a portable device for decontamination?
  - Is there a water supply to the ambulance bay?
  - Can water run-off from the ambulance bay be contained?
  - Can ventilation system in the Emergency Department be isolated from the rest of the hospital?

HOSPITAL DISASTER CONTROL CENTRE

6. Consider the following:

- Does the plan indicate where the Hospital Disaster Control Centre is located within the hospital? (Preferably this should be established away from the Emergency Department).
- Has an alternate location been designated?
- Have standing operating procedures been developed that stipulate:
  - who will occupy the centre;
  - who will be in charge;
  - provision for regular operational reporting;
  - what the responsibilities will be; and
  - what equipment and supplies will be needed to operate the Disaster Control Centre?
- Has provision been designated (eg space, equipment) for extra people who may come to the hospital to provide a service (eg volunteers and agencies from outside organisations)?
- Is there provision of alternative communication arrangements in circumstances where the hospital communication system fails/overloads?
- Under NSW HEALTHPLAN all hospitals are required to have at least one dedicated telephone line to the Area Health Services Disaster Control Centre. Tertiary referral hospitals are required to have at least two such dedicated lines. These lines are to have an unlisted number and should

be able to permit calls to be transferred or if they are direct lines, be situated in the Hospital Disaster Control Centre.

SECURITY

7. Consider these questions:

- Has recognition been given to:
  - the extent of possible security problems (eg geographical location, physical plan arrangements, number of entrances, etc);
  - uniqueness of security problems both internally and externally; and
  - possible shortcomings of personnel to provide security?
- Have steps been taken to minimize and control points of access and egress in buildings and areas?
- Have steps been taken to control vehicular traffic and pedestrians?
- Have arrangements been made to meet and escort responding emergency service personnel?

COMMUNICATIONS SYSTEMS

8. Consider these questions:

- Does the plan recognize that normal systems (eg telephone, facsimile, cellular phones) will likely be rendered unserviceable during disasters?
- Is there provision of alternative communication arrangements in circumstances where the hospital communication system fails/overloads (eg unlisted telephone numbers, pay telephones, walkie-talkie sets, etc)?
- Is there an organised runner, messenger system as back-up for power failures, disasters, etc?
- Are runner personnel provided with schematic area layout maps showing key areas for disaster operations?
- Has the hospital established communication networks with the Area Health Disaster Control Centre?

INTERNAL TRAFFIC FLOW AND CONTROL

9. Consider these questions:

- Has provision been made for the free and uninterrupted flow of in-house traffic, eg pedestrian traffic in corridors, casualty movement to and from special treatment areas?
- Have egress routes for patients and staff been provided for hospital evacuation purposes?

- Will elevators be manned and controlled?
- Has elevator usage been prioritised (eg casualties, medical supplies)?
- Have movement routes been designated within the hospital and have traffic flow charts been prepared and posted?

EXTERNAL TRAFFIC FLOW AND CONTROL

10. Consider these questions:

- Have arrangements been made for both vehicle and people entrance to and exit from the hospital premises?
- Are arrangements in place for:
  - uninterrupted flow of ambulances and other vehicles to casualty sorting areas or emergency room entrance;
  - access and egress control of authorised vehicles carrying supplies and equipment;
  - authorised vehicle parking; and
  - direction for authorised personnel and visitors to proper entrances?
- Have arrangements been made for police support?
- Has recognition been given to the management of vehicle and people convergence upon the facility?

VISITORS

11. Consider these questions:

- Is it recognised that visitors can be expected to increase and curious onlookers may seek to gain entrance during disasters?
- Has provision been made to establish waiting areas, with provision for supportive counselling, away from the Emergency Department to minimise exposure of relatives and friends of disaster victims?
- Has provision been made to handle medical and emotional situations resulting from the anxiety and shock of the disaster situation?

MEDIA

12. Consider these questions:

- Do the media have a designated area?
- Has this area been located well away from the:
  - Emergency Department;
  - Hospital Disaster Command Centre; and

  - waiting area for relatives, family and friends?

- Has a position holder been designated to control and take care of the housekeeping needs of the media?
- Does the Plan designate a spokesperson as a media contact?
- Has provision been made to identify the procedures for handling requests for information from the media?

RECEPTION OF CASUALTIES AND VICTIMS

13. Consider these questions:

- Is there a precise plan of action whereby, at short notice, multiple casualties can be received and:
  - iIdentified;
  - registered;
  - triaged;
  - treated in designated treatment areas; and
  - admitted or transferred?
- On the confirmed notification of a disaster, does the plan provide for:
  - clearance of all non-emergency patients and visitors from the emergency department;
  - cancellation of all elective admissions and elective surgery;
  - determination of rapidly available or open beds; and
  - determination of the number of patients who can be transferred or discharged?
- Has provision been made to secure traffic access to the Emergency Department and control the access to allow timely ambulance turnaround?
- Is the receiving and sorting area accessible and in close proximity to the areas of the hospital in which definitive care will be given?
- Is the reception area equipped with portable auxiliary power for illumination and other electrical equipment, or can power be supplied from hospital circuits?
- Does the reception area allow for retention, segregation and processing of incoming casualties?
- Are sufficient equipment, supplies and apparatus available, in an organised manner, to permit prompt and efficient casualty movement?
- Can radiological monitors and radiation detection instruments be assigned to the area, if required?

- Has provision been made for a large influx of casualties to include such factors as:
  - bed arrangements;
  - personnel requirements; and
  - extra resources (eg interpreter services, linen, pharmaceutical needs, dressings, etc)?
- Are the medical records and the admissions departments organised to handle an influx of casualties?
- Is there a system for retention and safe-keeping of personal items removed from casualties?
- Is there a plan to segregate/isolate disaster victims from the rest of the hospital if those victims are contaminated (eg hazardous materials)?

HOSPITAL EVACUATION

14. Consider these questions:

- Is there an organised discharge routine to handle large numbers of patients upon short notice?
- Is it detailed that a position holder is responsible for the removal and control of patient records and documents?
- Has provision been made for immediate refuge, care and comfort for the patients and staff on the hospital grounds during inclement and winter weather?

RELOCATION OF PATIENTS AND STAFF

15. Consider these questions:

- Have satellite locations been pre-determined and confirmed for the housing of patients and staff in the event of an evacuation?
- Have transportation requirements been pre-designated for the movement of people?
- Has provision been made for the movement of patient records and documents?
- Is there a ‘time sequence’ built into the plan designating appropriate moving times, assigned personnel including professional staff assignment, and priority of patients to specific locations?
- Is there a method for delegating authority and decision-making responsibility for relocation transfers?
- Is there a sequence for patient transfers along pre-established routes?

- Are procedures established for the orderly disposition of patients to their homes if applicable?
- Has provision been made for the movement of patients and staff to an immediate area of safe refuge within the hospital when the area occupied becomes uninhabitable?

HOSPITAL ISOLATION

16. Consider these questions:

- In the event that the hospital is completely isolated, has the plan assigned position holders responsible for:
  - auxiliary power;
  - rest periods and rotation of staff;
  - rationing of water and food;
  - waste and garbage disposal;
  - rationing of medication, dressings, etc;
  - laundry; and
  - staff and patient morale?
- Has consideration been given to utilize patients and visitors to assist staff with their duties?

RESPONDING TO AN EXTERNAL DISASTER

17. Consider these questions:

- Does the hospital have a designated disaster medical response team?
- Does the plan specify:
  - who is on the team;
  - who is in charge of the team;
  - who has the authority to activate the team;
  - what medical equipment they take with them;
  - how they get to the incident site;
  - what their role is at the site; and
  - what are their duties after they return to the hospital?
- Does the plan specify if Disaster Medical Kits are provided and do they conform to the minimum equipment list as designated in HEALTHPLAN?
- Are the team provided with personnel protective equipment as detailed in HEALTHPLAN?

POST-DISASTER RECOVERY

18. Consider these questions:

- Does the plan designate who will be in charge of recovery operations?
- During recovery does the plan make provision for:
  - documentation;
  - financial matters;
  - inventory and resupply;
  - record preservation;
  - clean-up;
  - hazard clean-up;
  - salvage;
  - garbage and waste disposal;
  - special cleaning and deodorizing;
  - utility and equipment servicing;
  - redecorating;
  - construction; and
  - board-up?
- Does the plan address a:
  - critical Incident Stress Debriefing Program;
  - Employee Assistance Program;
  - group/individual counselling services; and
  - Family Support Program?

EDUCATION AND TRAINING

19. Consider these questions:

- Does the plan specify who is responsible for the Disaster Education and Training Program?
- Do the hospital departments have on-going, mandatory disaster training programs?
- Has the hospital considered adapting disaster procedures for application when dealing with routine procedures, so personnel can become familiar with them?
- Does the program provide disaster education material at staff orientation to ensure staff awareness?

- Does the program provide on-going disaster education to ensure staff awareness and currency of procedures?
- Does the program have inter-organisation joint training sessions that deal with common aspects of disaster response?

EXERCISING THE DISASTER PLANNING PROGRAM

20. Consider these questions:

- Does the hospital exercise program conduct an exercise, annually, with a view to:
  - ensuring all key participants are familiar with the contents of the plan; and
  - testing specific aspects of the plan?

ARRANGEMENTS FOR REVIEWING, TESTING, EVALUATING AND MAINTAINING THE PLAN

21. Consider these questions:

- Does the plan nominate a position holder who is responsible for ensuing the plan is reviewed, tested, evaluated and maintained in a current state?
- Does the plan suggest criteria for review of the plan such as:
  - an annual basis;
  - following an actual incident/disaster that required activation of the plan; or
  - after any disaster exercise?
- Does the plan note the procedures and processes that all proposed changes to the plan will be subject to, including:
  - central distribution of amendments;
  - committee recommendation;
  - approval and endorsement processes prior to being incorporated into the plan?

DESIGNATED AREAS

22. Upon your facility/hospital HEALTHPLAN being activated to receive incoming disaster victims the following occurs:

- ..... becomes Hospital Disaster Control Centre.
- ..... becomes Triage Area.
- ..... becomes Staff Personnel Muster Area.
- ..... becomes Volunteer Workers Muster Area.

- ..... becomes Patient/Victim Reception/Registration Area.
- ..... becomes Family/Visitors Waiting Area.
- ..... becomes Media/Press Area.
- ..... becomes Priority 1: Red Tag Patient Treatment Area.
- ..... becomes Priority 2: Orange Tag Patient Treatment Area.
- ..... becomes Priority 3: Green Tag Patient Treatment Area.
- ..... becomes Priority 3: Green Tag Patients Discharged Area.
- ..... becomes Temporary Morgue.

HOSPITAL CONTROL CENTRE ARRANGEMENTS

INTRODUCTION

1. In general terms, most hospitals are not used to running / establishing hospital control centres, as opposed to other agencies, such as the Ambulance Service, who utilise control centres as part of their daily operational activities. As such, it is vital that hospitals exercise this function on a regular basis. While there are few texts that outline the arrangements for establishing and maintaining a hospital control centre, the following guidelines are offered.

PHYSICAL LOCATION AND FEATURES

2. At least two locations should be identified, with a preferred and secondary location. It is important for the location not to compromise the function of major casualty receiving areas, but to also not be so distant as to make communication impossible.

- ***Size***—A large single room is preferable, with room either for lots of bench space, or for tables to be easily moved in.
- ***Access to Communications***—In practical terms, it is very difficult for a control centre to function with less than 4 telephone lines. Ideally these should have silent numbers, and at least one line should be independent of the PABX/hospital switchboard system (ie a dedicated outside line). A fax machine and photocopier should also be readily accessible.
- ***Storage Space***—It is also an advantage if there is some dedicated storage space available in the room for equipment such as stationery, phone directories, and up to date copies of the relevant disaster plans (both hospital and area).

FUNCTION

3. The hospital control centre fulfils a number of different functions, which then impact on staffing and resource requirements. These include the following:

- ***Communication with All Relevant Areas of the Hospital***—This is to ensure states of preparedness, to arrange for additional staffing and resources as required, and to gauge the impact of casualty loads on these areas.
- ***Communication with Outside Agencies***—In general terms, information will be received from a higher control centre / ambulance control centre / area medical health coordinator, with regard to numbers and types of casualties coming from the site, as well as timeframes. This information needs to be considered in terms of it's likely implications, and action taken in a timely fashion (ie ordering in specific supplies such as extra local anaesthetic / suture sets for multiple lacerations, or arranging interpreters for non English speaking casualties). Casualty receiving areas should be notified immediately when such information is received. In return, the

higher control centre will be seeking information as to the current status of the hospital, such as its bed status, ability to receive casualties and ability to deploy further medical teams.

- ***Maintenance of Information on Further Casualty Capacity***—Information with regard to bed availability needs to be kept on a ward by ward basis. This should ideally be displayed on a whiteboard. In addition, the capacities of areas such as the emergency department, operating theatres and intensive care should also be identified.

- ***Staffing Allocation/Call-In***—Actual call-in of staff may occur from the control centre, or alternatively it may be delegated to another area. Staff should not physically attend the control centre, but need to be located in a central location such that they can be readily sent on request to areas. A record of which staff are called in should be kept.

- ***Acquisition of Additional Resources***—Additional resources may be requested through the hospital control centre, and accessed from other sources.

- ***Management of Media/Outside Enquiries***—An overall media policy needs to be determined prior to an incident occurring. If the hospital is to handle media enquiries, a designated number should be identified, and consistent information provided, respecting patient confidentiality. Calls from relatives should be directed to a separate area of the hospital. In the event of large disasters, an 1800 number should be considered. *Press conferences should not be held in the hospital control centre, but in a separate briefing room*.

- ***Patient Tracking***—Information on casualties needs to be collated and documented, with regular condition/location updates.

- ***Maintenance of a Log***—It is important to keep a written record of what happens and what decisions are made together with the time, particularly when resources are requested.

STAFFING

4. To allow these functions to be effectively performed, the following positions may be required:

- ***Hospital Controller***—Responsible for the overall coordination of the hospital response to the disaster

- ***Nursing Coordinator***—Responsible for allocation of staff, calling in of staff, liaison with wards and departments.

- ***Business Coordinator***—Responsible for support services, accessing additional resources, environmental services including catering.

- ***Adequate Support/Clerical Staff***—To provide support to above. Mechanisms need to be identified for accessing these staff after hours.

- ***Media Liaison Officer***
- ***Ambulance Liaison Officer***—Especially for prolonged impact disasters.
- ***Hospital Fire/Safety Officer and/or Engineer***—Primarily for internal emergencies.
- ***Runners***—(minimum of 2)

If the disaster becomes prolonged, there is a need to identify suitable relieving staff for the above personnel. In addition, it should be noted that as the disaster extends, the composition of the staffing may need to change to reflect this (ie involvement of recovery/welfare agencies etc). *During a disaster, key staff should not leave the control centre unless absolutely necessary. If they do, they should be able to be readily contacted*.

EQUIPMENT

5. The following equipment is required:

- Whiteboards, whiteboard pens and computers.
- Adequate tables/chairs/bench space.
- Adequate stationery.
- Telephone directories.
- Relevant disaster plans.
- Ready access to fax/photocopier and computers.
- Telecommunications as previously identified.
- preferably some form of alternative communication.
- Access to tea/coffee making facilities.

ACTIVATION

6. Normally hospital preparations will commence prior to the hospital control centre being established. Key staff should arrange to meet at the hospital control centre. To activate the hospital control centre requires notification of the higher control centres, as well as internal notification of switchboard and all relevant wards and departments. Contact numbers and location should be advised, as frequently they have changed from the last exercise/disaster! With regard to de-activation, the hospital controller should make this decision, with notification of all the areas as above.

INFORMATION

7. The following information needs to be kept in white board/written form:

- Hospital log (ie sequence of events).
- Names, numbers and locations of staff called in.
- Bed availability—Wards, Emergency Department, Intensive Care Unit, total.
- Patient tracking information—Location, condition, number.
- Resources requested from outside organisations.
- To ensure that all staff in the control centre are kept informed, it may be necessary to have a regular briefing of all staff on a 30–60 minute frequency basis.

CONCLUSION

8. An effectively functioning hospital control centre is vital to an effective overall hospital response. The key to this is the regular exercising of such a function.

HOW TO CONDUCT A SIMPLE HOSPITAL DISASTER EXERCISE

PLANNING MEETING

1. Arrange a planning meeting—ideally with the hospital disaster planning committee, ambulance service representative, as well as someone with experience of running exercises.

2. At the meeting, the following factors need to be decided:

- The date of the exercise (needs to be at least one month away).
- The venue (needs to be large enough, with audiovisual aids etc).
- The type of exercise—discussion exercises are the easiest, although simulated casualties are probably better at testing Emergency Department or site response.
- The time available—to be effective, at least half a day is needed. This should be selected during a relatively quieter time during the week ie not Monday morning or Friday afternoon.

WARNING LETTER

3. Having decided these factors, a warning letter needs to be sent out to all department heads, as well as external agencies involved. The letter should ask all participants to bring their hospital disaster manual with them, as well as to send a delegate if they are personally unable to attend. The room and catering (morning or afternoon tea) also need to be booked.

FURTHER MEETING

4. A further planning meeting then needs to be held with a smaller group, maximum two or three people. This meeting needs to decide on:

- the scenario and specific problems; and
- the timetable for the day.

THE SCENARIO

5. Scenarios for exercise purposes are generally broken down into three sections (which need to be documented), as follows:

- ***Background Information***—This would include such information as the population of the area, medical and ambulance facilities available, other nearby resources, and climatic/weather conditions. It needs to be typed on a separate piece of paper titled ‘Background Information’;

- ***General Idea***—This needs to include the nature of the incident (ie bus crash, earthquake etc—scenario's need to be credible), the site and timing, as well as the likely numbers of casualties involved. Ideally the number of casualties should be enough to stress the facility, without being so overwhelming that everyone gives up (20–25 casualties is probably more than enough). Once again, this should be on a separate piece of paper;

- ***Special Ideas***—The number of these depends on how long you want the exercise to run. They should all be on separate pieces of paper, so they can be fed in as need be. The activation of the plan is often a useful first problem, and participants should be asked as to who rings/contacts them and how, and how this will differ between in-hours and out-hours. Other special ideas can include:

  – call-in of staff;

  – setting up of a control centre;

  – setting up of the Emergency Department and triage area;

  – establishment of a casualty reception ward;

  – management of the deceased;

  – handling of relatives and the media; and

  – debriefing for both staff and victim.

  Depending on numbers, it is also possible to split the participants into syndicates, to look at specific areas ie one group may look at problems with relatives/media, whereas another group may look at arrangements for the Emergency Department. This allows more areas to be covered, but is more time consuming.

TIMETABLE

6. The timetable, as an example, needs to be roughly structured as follows:

- 0830–0900 Assembly and introduction. Needs to include what the objectives of the exercise are, as well as what administrative arrangements are (ie timings/catering/amenities). Participants should have already received the background brief handout.

- 0900–0930 Introduction of general idea. This may be augmented by maps/ diagrams, or even a short presentation from an expert on the nature/effects of the hazard (such as dam burst/earthquake etc). The general idea handout should be distributed.

- 0930–1000 Introduction of special idea 1 (activation). This can be done as a large group discussion exercise, working through ambulance/emergency department/site teams/hospital administration etc.

- 1000–1100 Introduction of further special ideas. These can be done either as syndicates or as a single group exercise. If done as syndicates, they need to be given 30 minutes to consider the problem, then at least 10

minutes for each syndicate to present. A record of syndicate presentations needs to be kept, so that they can be fed back to the hospital disaster planning committee.

- 1100–1130 Debrief/conclusion, including where to from here, and feedback on the value of the exercise. External agencies should be thanked for their participation.

FEEDBACK TO HOSPITAL DISASTER PLANNING COMMITTEE

7. Once the exercise has been conducted, a report needs to be written and circulated, with comments being sought.

PLAN REVISION

8. The disaster plan may need to be modified, and the next exercise planned.

CHAPTER 10

PUBLIC HEALTH—RESPONSE

INTRODUCTION

1. The public health objectives of disaster management can be stated as follows (Foege, 1986):

- To prevent unnecessary morbidity, mortality and economic loss resulting directly from a disaster.
- To eliminate morbidity, mortality and economic loss directly attributable to mismanagement of disaster relief efforts.

2. The issue of public health following a disaster is an important part of the emergency management process. In addition to being an important part of the response activities following a disaster, public health is also an integral part of recovery process and is often the practical basis upon which a community's recovery from disaster is based. Public health issues also highlight the importance of the interface between various agencies involved in the provision of services following a disaster.

PRINCIPLE

Collection, collation, interpretation and dissemination of accurate, objective and timely data is mandatory to efficiently and effectively manage the public health response to the disaster and to mitigate the effect of future disasters.

INFORMATION

Immediate Assessment

3. The first priority is to determine the nature of the disaster, which will then indicate likely public health problems. This will require immediate access to previously collected baseline data for the affected area, such as demographic and health characteristics.

4. The next priority is immediate assessment which must include:

- the geographical extent of the disaster;
- climate conditions;
- major public health problems;
- an estimate of the number of people affected;
- what further information is needed immediately; and
- the presence of continuing hazards.

Detailed Assessment

5. This should then be followed by detailed assessment as the disaster unfolds, including:

- the number of persons dead or injured;
- the estimated number of homes destroyed or damaged;
- the condition and viability of essential services;
- the availability of shelter;
- the anticipated number of persons requiring evacuation or temporary shelter; and
- the presence of continuing hazards.

Relief Priorities

6. The information from this assessment will then dictate relief priorities. Public Health issues which may need to be addressed are:

- provision of safe and adequate water;
- shelter;
- food and food related issues;
- provision of emergency ablution facilities;
- sanitation;
- personal hygiene;
- control and disposal of drugs;
- refuse collection and disposal;
- vermin and vector control;
- infectious disease control;
- disposal of dead stock and animals;
- disinfection;
- hazardous materials;
- siting and layout of emergency camp sites; and
- environmental hazards, eg blue green algae.

PRINCIPLE
The evaluation of public health disaster management must be an integral part of the process to ensure lessons are learned and experiences shared.

MANAGEMENT

7. Usually, the management of public health problems in Australia is delegated to local environmental health officers.

WATER

8. This section on water deals with the aspect of **quality, supply, sources, treatment, storage** and **transport**.

Quality

9. Important aspects to consider include:

- ***Safety and Control***—Provision of a safe and adequate supply of water is essential. The bacteriological, chemical, and physical condition of water for human consumption should comply with established standards. Consideration must be given to rationing and/or controlling the use of water.

- ***Aesthetics***—It is essential to remember to ignore the quality of water in terms of aesthetics, colour or even turbidity, providing there are no detrimental effects to the consumer through any chemical, toxins or bacterial contamination.

- ***Testing***—In major natural disasters the ability to test water supplies especially for bacterial contamination is likely to be a long involved affair and should not be relied on in these situations.

- ***Judgement Parameters***—It is necessary to attempt to make a value judgement on simple parameters, such as the source of the water, method of conveyance, removal of organic material, potential pollution sources, available methods of treatment.

- ***Bacteria***—If the population is accustomed to certain bacterial counts and physical conditions (sediment) in their water supply, providing the same conditions exist with replacement supplies to that found in the normal water supply this may be acceptable during an emergency for that particular community.

Supply

10. Key points to note include:

- ***Water Must be Safe to Drink***—If possible it must also be pleasant to drink. It must also be readily available in adequate quantities. People can exist for days without food, but they cannot live for long without water, especially in Australian summer temperatures. The very young, the sick, and the very old are most at risk.

- ***Minimum Requirements for all Purposes***—The minimum quantities of water for all purposes per person per day are as follows:

CATEGORY	LITRES	
Person	20	Drinking component 4 litres
Feeding units per person	30	
Medical unit per casualty	60	

- ***Drinking Allowance***—Remember the drinking water part of this allowance (4 litres) must be increased in hot conditions or where heavy work is being done. To conserve available potable water for drinking and food preparation, other sources of water should be used, where risk to health is least likely.

PRINCIPLE
Water must be safe to drink, and readily available in adequate quantities.

Sources

11. It may be necessary to find new sources of water and arrange for emergency disinfection and distribution. In an emergency situation, all water for drinking or food preparation should be considered to be contaminated and to require treatment. It is unlikely that laboratory services will be useful or even available. Safety practices for various sources are as follows:

- ***Water Authority Reticulations***—These may be adequate to supply the volume required, but they must be checked to ensure that the:
  - catchment is not polluted;
  - treatment plant is working correctly; and
  - reticulation system has not been broken.

  Before reuse, a reticulated water system must be flushed and disinfected. In addition the domestic water pipes must also be flushed and disinfected. If possible obtain a plan of the reticulation system when flushing the mains to ensure completeness of process and identification of dead ends.

- ***Private Systems***—These may belong to dairies, food plants, soft drink manufacturers, or private premises. Whatever the source, they must be checked as above.

- ***Springs and Wells***—Ground water is less subject to gross contamination than surface water and may need no treatment except disinfection. If a well is established for the people drawing water, provide a raised curb and slope paving to drain surface water away from the well. If possible, place a dependable supervisor in charge.

- ***Surface Waters***—All surface waters must be treated as contaminated. Choose a spot for the water point as far away from potential pollution as possible, and protect the water and catchment area from contamination by humans or animals.

Water Treatment

12. Raw water must be clarified and disinfected prior to use. Specific water treatment requirements are specified in Annex A to this Chapter.

PRINCIPLE
Water of doubtful purity should be treated before being consumed.

Storage of Treated Water

13. Storage vessels for treated water should:

- be clean;
- have covers;
- be above ground level;
- be in a cool position;
- be cleaned periodically; and
- be mosquito proof.

Transport of Treated Water

14. It may be necessary to advise on the transport of treated water into a disaster area (eg bush fire area with all tanks destroyed). Care must be taken to ensure that:

- water to be transported is potable; and
- containers for the water (jerricans, tankers) are clean and unlikely to taint the water. Avoid using railway tank cars, fire tankers, trade waste tankers and road construction tankers, which may have had chemicals added to their tanks when used in their normal role. If necessary flush and disinfect all water tankers before using.

Other Hazards Associated with Water Supplies

15. Blue-green algaes are natural inhabitants of many inland waters, estuaries and seas. Under certain conditions these algae may release toxins into the water which can pose a threat to animals and human health. In still water, these algae may multiply sufficiently in summer months to discolour the water so that it looks blue-green or greenish-brown.

16. Drinking water contaminated with blue-green algae or algal toxins may cause gastrointestinal symptoms (nausea, vomiting) and possibly liver damage (This will depend on type and quantity of toxins present). Swimming, bathing or showering in water contaminated by blue green algae may cause skin rashes, eye irritation, vomiting, diarrhoea, fever, muscle weakness or cramps and pains in muscles and joints.

17. ***Treating Affected Water***—Algae can be removed by filtration or killed with algaecides such as copper sulphate. Algaecides should be used only where no

other alternatives are available. Use of algaecides causes disruption of cells which causes the release of toxin into the water. Boiling does not inactivate the toxins. Filtration through active carbon will remove toxins. Toxins may remain potent for several weeks after the algae have disappeared.

SHELTER

Urgency and Resource Factors

18. The urgency and type of shelter provided will depend on the:

- availability of shelter;
- type of disaster;
- climatic conditions;
- availability of water, toilets, latrines, showers, power, food; and
- number of disaster affected persons.

Use of Home Sites

19. In most instances, disaster affected persons will want to return to their own homes or home sites. This should be encouraged as soon as possible but only if basic needs are available, the site is cleared of any potential hazards having regard to septic tank position, and underground pipes and drains.

Site Identification

20. Sites for temporary shelter should be identified in preparedness plans. Indiscriminate or uncoordinated use of shelters may give rise to increased risk of unsanitary conditions.

Emergency Shelter

21. Emergency campsites should be provided as a last resort. All efforts should be made to accommodate people in predesignated facilities eg halls or schools which have been selected according to predefined criteria as described in Annex B to this Chapter.

22. In the absence of suitable facilities consideration should be given to the establishment of campsites based on the criteria in Annex C to this Chapter.

FOOD AND RELATED CONCERNS

23. This section covers the subjects of food management, food poisoning, emergency food production/preparation, supervision of food handlers, mass feeding, examination of damaged food, examination of donated food, personal hygiene and disinfection.

PRINCIPLE
In disaster-prone areas the population should be encouraged to maintain a supply of 'long-life' basic food rations sufficient for a family for 4 to 7 days.

Food Management

24. It is important to recognise the following:

- ***General***—Appropriate sanitary measures must be applied to the storage, preparation and distribution of food to minimise the risk to the community.
- ***Temporary Catering Facilities***—In certain situations it may be necessary to set up temporary kitchens. Specific guidelines on all aspects of emergency catering are contained in the Australian Emergency Manual on Emergency Catering Guidelines.

Food Poisoning

25. ***Disease Risk***—In disasters, conditions may favour the outbreak of food-borne diseases, and the consequences of such an outbreak could be overwhelming. The health and medical services, which might already be short staffed and fully focused on urgent situations, might not be able to cope. These considerations show clearly the necessity for the proper planning and operation of food sanitation programs in disasters including:

- quantities and types of food;
- lines of supply;
- premises and preparation; and
- means of distribution.

PRINCIPLE
Proper sanitary conditions in food preparation and distribution areas are essential.

Emergency Food Production/Preparation

26. Measures that can be applied to ensure safe emergency food production include:

- quality control of incoming food in order to detect spoilage and contamination including a knowledge of the source and type of food;
- knowledge of the water supply to ensure its safety or if necessary its treatment;
- control of insects and rodents in stores, kitchens and feeding centres;
- provisions for the proper storage of food (eg freezers, refrigerators, dry store);

- provision for the proper disposal of solid and liquid food wastes (eg grease traps, burial, cartage, and incineration);
- provision of the proper washing and sanitising of utensils (eg cutting boards);
- supervision of food preparation areas; supervision of food servicing (eg appropriate cooking methods);
- supervision of food handling personnel;
- reliability of food source when possible (eg supermarket); and
- the method for transporting food (eg trucks, cars, aircraft).

Special Food Surveillance

27. Areas that need special attention and supervision include:

- the method of transporting food (eg trucks, cars, aircraft);
- examination of donated food (eg wholesomeness);
- examination of disaster-affected food;
- conditions under which food has been stored and transported (eg temperature); and
- examination of food suppliers (eg food warehouses and supermarkets).

Supervision of Food-Handlers

28. Some key factors to observe include the following:

- ***Screening and Selection***—The kitchen supervisor will probably have to use whatever workforce is available eg. volunteers or organised responders. Medical screening of food handlers is never a particularly effective exercise and will be impossible under these conditions. The most that can usually be done is to exclude anyone with diarrhoea, vomiting, infectious lesions or exposed areas of infected skin, or a recent history of gastrointestinal illness.
- ***Food-Handling Personnel—***Important considerations are as follows:
  - *Health*—Exclude any person with a current or recent history of gastrointestinal illness or exposed skin lesion likely to contact food;
  - *Training*—Utilise people with training or previous commercial experience in food handling positions;
  - *Adequate Numbers*; and
  - Provision of separate toilet and hand washing facilities for food handlers where possible, to prevent cross-infection.
- ***Food-Handling Rules—***Certain rules, as set out briefly below, must be followed:
  - Only those with a job to do should be allowed in the kitchen.
  - Only those who are healthy and clean should be chosen to work in the kitchen.

– The kitchen staff should have a ‘dirty job’ group (cleaners) whose duties do not include food handling.

– Adequate hand washing facilities must be available and their use enforced.

– The kitchen, surrounds and utensils must be kept clean.

– Keep animals out of kitchen and surrounds.

– Keep all kitchen refuse in sealed and cleaned bins, and remove as often as is necessary.

– The use of garbage bags is recommended.

– Separate ablution, latrine and toilet facilities for the exclusive use of kitchen staff should be provided where possible.

– Personal hygiene is of the utmost importance.

- ***Supervision***—Regular supervision of feeding areas, particularly during the early stage of a disaster when personnel are operating 24 hours a day, usually in shifts of six hours.

- ***Additional Assistance***—If there are not enough suitably trained workers for the supervision of feeding centres, it may be possible to train suitable persons to assist with the inspection of food premises and reporting any deficiency or fault.

PRINCIPLE
Personal hygiene in handling food in disaster situations is of the utmost importance.

Mass Feeding

29. Information on the organisation of mass feeding centres is shown at Annex D to this Chapter.

- ***Disaster Planning***—This should include nominated buildings such as schools and community centres which are suitable for mass catering, and include the following facilities:

  – cooking areas;

  – toilets;

  – adequate supplies of safe potable water;

  – centrally located and well known to the public.

- ***Emergency Food Supplies***—After hours contact details for food manufacturers and suppliers should be maintained. Where possible utilise local businesses.

Examination of Damaged Food

30. It is important to undertake the following:

- ***Checking and Sorting***—Damaged food can be checked and often it will be safe if it is used quickly and handled properly. Perishable foods can be sorted out and used first. In the event of power loss of more than 36

hours, all frozen food will have to be consumed or destroyed. If power is cut off or even rationed, refrigerators will have to be kept for essentials;

- ***Care in Use***—The use of damaged food and the priority for its order of consumption must receive careful consideration; and
- ***Risk of Contamination***—Damaged food which may have been affected by the disaster needs special consideration (seek advice from an Environmental Health Officer [EHO]) if the contents are to be consumed eg bottled foods immersed in flood water, canned foods affected by heat.

Examination of Donated Food

31. Key aspects include the following:

- ***Inspection and Storage***—When a disaster occurs donations of all forms are bought into the disaster area, including food. It is essential that all such foods are brought to a central inspection area where they can be examined by a trained person and correctly stored pending distribution.
- ***Acceptance and Disposal***—It is better to accept all food donations, even if it is obvious that they are unsuitable and to dispose of the food after the donor has left the site. This overcomes the problems of:
  - unauthorised food distribution; and
  - embarrassment to the donor who, in good faith, may have travelled a long distance to donate the food not knowing its suitability.

PRINCIPLE
Fresh food donations should be discouraged.

Personal Hygiene

32. Key matters include the following:

- ***Limiting Disease***—Personal hygiene may be neglected in times of emergency, especially in densely populated areas, such as evacuation and accommodation centres. In these circumstances, the risk of spreading disease is increased. Personal hygiene is the responsibility of the individual. This promotes health and limits the spread of infectious disease, especially those transmitted by direct contact.

PRINCIPLE
All disaster affected persons need to be informed about and encouraged to practice personal hygiene.

- ***Advice to Workers***—All relief workers and affected persons should be advised to:
  - wash hands in soap and water immediately after going to the toilet and always before handling and/or eating food;
  - avoid the use of common or unclean eating utensils, toothbrushes, razors, drinking cups, towels, handkerchiefs, combs, and hairbrushes;

– avoid coughing and sneezing on others; and

– wash hands thoroughly after handling a patient or his/her belongings.

- ***Basic Facilities***—Providing displaced persons with cleaning and bathing facilities will encourage attention to hygiene. Overcrowding in sleeping quarters should be avoided.

Disinfection

33. Where equipment or materials require disinfection to prevent the spread of disease the following methods are recommended:

- All equipment and surfaces must be cleaned before disinfection.
- Choose heat for disinfection where possible.
- If the application of heat is not possible use a chemical disinfectant such as a hypochlorite solution using a concentration giving 100 to 200 ppm of available chlorine for a scrupulously clean surface. Where absolute cleanliness cannot be assured, a concentration giving 1000ppm or more of available chlorine will be required. Dilution factors are given in Annex E to this Chapter.
- Chemical disinfection solutions are to be prepared fresh daily, in clean, dry and preferably heat treated containers.
- The effectiveness of a chemical disinfectant depends on preparation, application methods and the users.

SANITATION

34. This section deals with emergency washing and toilet facilities, refuse disposal, disposal of dead animals, vermin and vector control.

Emergency Washing and Toilet Facilities

35. Matters to consider include the following:

- ***General***—The provision of temporary ablution facilities may be necessary where existing facilities are damaged or additional facilities are required. Temporary facilities will also be needed where temporary camp sites, either short term or long term, have been established. These facilities will be located in accordance with the Shelter Section, Paragraph 18 of this Chapter. The efficient disposal of waste matter of all kinds is important to health for:

  – prevention of contamination of drinking water;

  – prevention of contamination of food;

  – eradication of fly and vector breeding places; and

  – control of rats and mice.

- ***Multiple Mobile Facilities***—these are large commercial units that may comprise toilets with handbasins, showers, wash basins, and laundry facilities consisting of troughs and positions for washing machines and clothes dryers. These are the preferred option.

These systems can be connected to the mains or pressurised water supply and waste can be discharged to the sewer or inbuilt holding tanks or other nearby holding facility.

- ***Single Portable Toilets***—These are either water flushed or chemically flushed and have small holding facilities requiring regular pumping out. These are available through building construction hire companies.

- ***Sanitary Pans***—These require a panstead and closet and may be available through some building construction hire companies. Sanitary pans are provided by a sanitary contractor or sewerage authority.

- ***Emergency Toilet Shower and Laundry Facilities***—Where existing permanent or mobile facilities cannot be provided, temporary facilities can be constructed on site. Facility needs and construction requirements are detailed in Annex F to this Chapter.

Recommended number of sanitary facilities to provide are included in Annex G to this Chapter.

Use of Existing Septic Tank Systems

36. Following a disaster, it may be possible that existing septic tank systems could be used either when relocating people back onto their property or, when utilising a community hall. Before this is undertaken, ascertain whether the tank is still useable, ie damage to tank, disposal area, plumbing fixtures. Existing septic tank systems will not work if the water reticulation system is not operating.

37. If water supply is adequate and the septic system is working the use of a bucket to clear waste from the toilet and into a septic system is to be encouraged.

38. If demolition machinery is to be used on properties, septic tank systems should be identified, marked and isolated if useable.

39. For premises, where large numbers of people may be using the facilities, it will be necessary to regularly de-sludge the septic tank and to isolate the disposal area to prevent damage or prevent locating facilities such as food storage areas over disposal areas.

Disposal of Sullage Wastes

40. In the prolonged occupation of any site for camp purposes, the disposal of sullage water (kitchen, shower/hand basin and laundry waste) is a problem of great importance, as between 30 to 150 litres per person may be produced daily.

41. Waste water from kitchens contains a considerable amount of fat in the form of grease, while water from baths and laundries contains a large quantity of soap. These factors, if not considered will ultimately lead to failure of the soil to absorb the wastes discharged onto it, or into it.

42. Soaps and greases may be removed from waste water prior to disposal to soakage pits to prolong the life of the pit or absorption qualities of the soil. The simplest are either strainer traps or cold water grease traps. A simple strainer through which the cold water passes may be used either alone or in conjunction with a cold water grease trap. Construction of these facilities is detailed in Annex F to this Chapter.

Drug Disposal

43. Depending on the extent of an emergency/disaster, the collection, isolation and disposal of pharmaceutical and vetinary drugs, maybe present a public health risk due to illicit or accidental use.

44. As far as practical, all drugs collected following an emergency/disaster should be incinerated. If this is not practical due to circumstances, they should be disposed of by deep burial ensuring the trench or pit is backfilled immediately.

Refuse Disposal

45. Key aspects to consider are as follows:

- ***General***—Disaster conditions may overwhelm normal tip facilities. In a disaster, public health issues such as vector and vermin control depends on the appropriate collection and removal of refuse.
- ***Refuse Categories***—Refuse can be categorised for removal as:
  - *putrescible garbage* (wet garbage) such as food scraps, discarded fruit, kitchen waste, and vegetables;
  - *dry refuse/non-putrescible garbage* such as ashes, cinders, papers, old iron, tins, bottles, rags, cardboard;
  - *indestructible refuse* such as used building material; and
  - *potentially dangerous refuse* such as gas tanks, petrol tanks, refrigeration units.
- ***Bashing and Burning***—In a disaster it will be necessary to 'save space' due to the lack of sufficient bulk refuse receptacles or the lack of special vehicles required to move the same. The 'Bash and Burn' technique may have to be employed in disaster situations in spite of the undesirable effects of burning refuse. (This would apply to dry material only). 'Bashing' or compressing containers reduces bulk, thereby giving more space in the refuse bin.
- ***Storage***—Plastic garbage bags are an asset for the temporary storage of putrescible material and should be used if available. However, care should be taken to ensure that these containers are not damaged in any way and that dogs, cats and other animals are not likely to have access to them. Where plastic garbage bags are used, it is essential that they are securely sealed at the top, and care taken to avoid putting jagged objects inside such as glass and tins.
- ***Selection of Tip Sites***—Should the usual garbage disposal site be either inaccessible or unusable for any reason, alternative facilities must be established. In selecting an alternative site the factors that must be considered are:
  - suitability of terrain—soil quality;
  - availability of surface coverage soil;
  - likelihood of leaching;
  - height of water table;
  - accessibility—all weather road;
  - proximity of rivers, streams and creeks; and

– likelihood of nuisances being caused (eg flies, vermin, breeding factors, environmental pollution).

PRINCIPLE

The primary aim of disposing waste material is to prevent the transmission of disease and make areas safe and accessible.

- ***Sanitary Landfill***—This is one of two disposal methods likely to be employed in a disaster area. In this method the use of depressions, gullies or low lying lands is recommended and the following points should be applied:
  - Only putrescible wastes should be transported to a sanitary landfill site. Putrescible waste should be covered with soil to a depth of 1 m for bulk sanitary land fill sites and to a depth of 0.5 m for small local burial sites.
  - Bulky non-putrescible wastes should be stored at alternative sites away from the sanitary landfill site.
  - It may be necessary to burn timber but sorting material out also puts a strain on resources.
  - Other indestructible matter such as steel lintels, car bodies, heavy machinery, where possible should be separated, and particularly gas cylinders, refrigerators or freezers.
- ***Incineration***—This is the second likely disposal method. This process reduces refuse to about one quarter of its original weight. In addition, incineration will destroy all fly larvae and prevent the proliferation of vermin. In a disaster, large incinerators will probably not be available; however, small on site incinerators may be constructed in emergency situations as shown in Annex H to this Chapter.
- ***Dump Master Bins***—Where possible the use of Dump Master Bins in disaster areas should be encouraged, however, constant surveillance of the bins must be made to ensure that only appropriate household garbage is being deposited in them. In the event of Dump Master type bin not being available, other receptacles may be provided eg 200 litre drums, together with properly fitted lids. Constant surveillance of these receptacles is required to ensure that only domestic rubbish is being placed in them and that they are cleaned and disinfected regularly.
- ***Transportation of Refuse***—Should conventional refuse removal not be available, any vehicle fitted with a tip-tray and high sides would be satisfactory. Care should be taken to ensure that any liquid or semi-liquid waste that may be present in the load, does not leak on to the road while being transported. To eliminate this possibility, it would be wise to line the tray with plastic membrane prior to loading. In all instances where ‘unconventional’ vehicles are employed, it is essential to ensure that the loads are also covered with a suitable tarpaulin or plastic sheet.
- ***Open Dumping***—Open dumps give off objectionable odours and are potential breeding grounds for flies and vermin. Some components of refuse are suitable for open dumping. These include debris such as bricks, concrete and roofing tiles. However, serious nuisances and hazards may result if garbage or mixed refuse is disposed of in this manner.

Hazardous Waste Disposal

46. ***Definition***—Hazardous waste is waste that has physical, chemical or biological characteristics, which require special handling and disposal procedures to avoid risk to health and/or other adverse environmental effects. When attempting to define hazardous waste, concern is essentially with wastes that present either of the following:

- *Short-Term Acute Hazard*—These include acute toxicity by ingestion, inhalation, skin absorption, corrosion or other skin or eye contact hazards, or a risk of fire or explosion.

- *Long-Term Environmental Hazards*—These include chronic toxicity upon repeated exposure, carcinogenicity, resistance to detoxicification processes such as biodegradation, the potential to pollute underground or surface waters, or aesthetically objectionable properties, such as offensive odours. Wastes with these properties may arise as by-products, side-products, process residues, radioactive residues, contaminated plant or equipment from manufacturing operations and the discarding of manufactured products.

PRINCIPLE
Hazardous waste is waste that has physical, chemical or biological characteristics, which require special handling and disposal procedures to avoid risk to health and/or other adverse environmental effects.

Criteria for Identifying Hazardous Waste

47. ***Characteristics***—Waste has the potential to be hazardous by virtue of substances present in it, according to:

- the concentration of their chemical reactivity;
- the physical form in which they present;
- its quantity and latent heat generation;
- its mobility and persistence within the environment in which it is placed;
- targets available in its environment, and their vulnerability; and
- the possible requirement for remedial measures, and their cost.

48. Relevant hazard characteristics mentioned above can be defined by the following criteria:

- ***Composition***—The individual components of waste should be known before assessment of its hazard potential is made. This knowledge, however, is often very difficult (or even impossible in practical terms) to obtain, particularly for solid waste. Nevertheless, good information on waste composition is needed and in many cases, broad composition data will be adequate.

- ***Physical Form***—The physical nature of waste (solid, semi-solid, sludge, liquid) has the potential for acute or long-term environmental hazards. In

general, liquid or sludge waste is more liable to cause **water pollution** problems than is solid waste. Where an inhalation hazard exists, as with asbestos, fibrous waste is inherently more dangerous than is matrix-bond waste, such as asbestos cement.

- ***Quantity***—The quantity of the waste and its recurrent rate of generation are important. The handling and disposal of a few hundred kilograms of a particular waste as an isolated case, may demand a totally different solution to the disposal of similar material generated regularly.

- ***Biological Hazards***—The movement and storage of infective biological materials may present an additional hazard in an emergency:
  - If a container is broken during transportation:
    * check label, which lists the contents and the consignor or consignee;
    * notify consignor or consignee; and
    * isolate container until expert assistance can be arranged.
  - If damage occurs to laboratories handling biological hazards, isolate the area until expert assistance is arranged.

- ***Radioactive Hazards***—Radioactive sources are used in industry, medicine and research. The possibility of an accident exists in the workplace and during transport. Radioactive materials are stored and transported in containers designed to keep radiation within safe levels and undamaged containers present no radiation hazard.

- ***Damaged Containers and Spillages***—If there is damage to containers and there is a leak or spill:
  - contact relevant authorities to arrange for expert assistance for advice, removal or repair;
  - cordon off area;
  - do not wash spillages down drains;
  - take action to prevent spread of spilled material, by using sand or earth when possible and safe to do so; and
  - remove any injured person if possible but do not put yourself of others at risk.

- ***Environmental Demands of Disposal Techniques***—As a basic principle, waste should be disposed of so that adverse effects to the welfare of the community are minimised, and in particular, so that:
  - human health is not threatened and human well-being is not impaired;
  - livestock, game, other wildlife and fish are not threatened;
  - water bodies, soil and useful plants are not harmed;
  - the environment is not harmed by air pollution; and
  - law and public order are not otherwise threatened or disturbed.

Disposal of Dead Animals

49. Key aspects to observe include the following:

- ***Objectives***—The basic objectives to be achieved in disposing of dead animal carcasses, products and waste materials are to ensure that no spread of disease occurs to either humans or to other animals, and that the carcasses are effectively removed from public view. The opportunity for vermin and flies to access carcasses is minimised and the cost of disposing of animals concerned is kept to a realistic minimum.

- ***Personal Hygiene***—Care must be taken at all times when handling dead animals, including wearing of rubber boots, gloves, proper protective clothing and adequate personal disinfection.

PRINCIPLE
Strict personal hygiene must be practised in the handling of all dead animals.

- ***Selection of Disposal and Destruction Sites***—A decision must first be made on burning versus burying of carcasses. The method to be adopted will depend on the cause of death of the animals concerned, the availability of fuel, fire restrictions, location of the water table and availability of machinery. Factors to be considered are outlined in Annex I to this Chapter.

Vermin and Vector Control

50. Vermin and vectors (flies, fleas, lice, mites, mosquitoes, ticks) are disease carriers that develop rapidly in an uncontrolled environment.

51. Matters to address include the following:

- ***Risk of Disease Transmission***—Disasters do not generate 'new' diseases but, by altering the environment, they may increase transmission of diseases that already exist in a region through:
  - direct effect of the physical event itself, such as faecal contamination;
  - indirect effects that may result in such conditions as overcrowding and poor sanitation;
  - promoting or causing increase in the movement of populations;
  - disrupting routine vector control programs; or
  - altering the distribution of vector species.

The increased risk of transmission of vector-borne diseases must be seriously considered after all natural disasters. Therefore, it is a matter of priority that, the potential of transmission of vector-borne disease is assessed early in the post-disaster period. It is important to note that natural disasters do not necessarily lead to outbreaks of infectious diseases. This is particularly true of the mosquito-borne diseases, since the larval habitats and adult breeding sites of mosquitoes are often damaged. As a result, diseases such as malaria, dengue fever, Ross River fever and encephalitis may not appear until several weeks after the disaster, if they appear at all.

- ***Vermin and Vector-Related Diseases:***

Mosquitoes	Malaria, dengue fever, Ross River fever, viral encephalitis, filariasis
Houseflies	Diarrhoea, dysentery, salmonellosis
Cockroaches	Diarrhoea, dysentery, salmonellosis, lice, endemic typhus
Pediculosis	Relapsing fever, trench fever, skin irritation
Bedbugs	Severe skin inflammation
Ticks	Rickettsial fever, tularaemia, relapsing fever, viral encephalitis
Rodent mites	Rickettsial fever, scrub typhus
Rodent fleas	Endemic typhus, plague
Rodents	Rat-bite fever, leptospirosis, salmonellosis, melioidosis

PRINCIPLE

Disasters do not generate new diseases but, by altering the environmental conditions, they may increase transmission of diseases that already exist in a region.

- ***Assessment and Situation***—A significant control problem after different types of natural disasters is accurately assessing the potential of vector and vermin-related diseases and determining what resources are required. Also the time for which the problem remains may vary. Knowledge of the biology and ecology of pest organisms and their relevance to the current conditions is required when the effect of natural disaster damage on vector and vermin problems is being assessed. Examples are as follows:
  - Flooding usually flushes out or destroys mosquito breeding sites. It subsequently creates additional habitats that can eventually produce even greater mosquito densities.
  - When water and sewerage systems are damaged, increased storage of potable water can provide additional breeding sites for Aedes aegypti (vector of Dengue Fever) while temporary pit latrines can provide habitats for flies and Culex mosquitoes (vector of Ross River Virus, Australian Arboencephalitis, Kunjin and Japanese Encephalitis).
  - Inadequate food storage, poor sanitation and contamination by debris, animal carcasses and excreta may produce breeding areas for flies and an increase in rodent populations.
  - Problems related to vectors and vermin may not be confined to the affected region. Human movement away from the region may contribute to crowding in peripheral areas and, as a result, provide opportunity for the proliferation of diseases associated with vectors and vermin. For example, following water-related disasters, these peripheral areas may harbour potential mosquito breeding habitats that are more conducive as immediate breeding sites than in the disaster area.

- ***Determining Action Priorities***—Types of vector-borne diseases in the area and the density of the human population are factors to consider when setting priorities. When these are known, action should be immediately directed towards the areas of high population density, especially slum areas and camps where migrant populations are received. Every attempt should be made to restore and strengthen routine vector control operations within the disaster area. Urban, suburban and rural areas of high priority of receiving control efforts should be determined by considering all relevant criteria, including:
  - population at risk;
  - number of confirmed or suspected disease outbreaks;
  - recent history of disease transmission;
  - relative density of potential disease vectors;
  - significant increases in new breeding sites;
  - presence of potential disease reservoirs;
  - seasonal accessibility by ground transport; and
  - number and types of complaint calls regarding mosquito activity.
- ***Surveillance and Control***
  - *Immediate Action*—The major activities in vector and vermin control should occur during the immediate post-disaster period. If initial surveys and other sources of information indicate a potential problem, the sooner that post-disaster programs are implemented to reduce disease potential, the less is the chance that epidemics will occur. Delaying action may be medically and economically disastrous.
  - *Routine Operations*—Re-establishing and upgrading routine control operations, surveillance and training of staff will minimise the risk or impact of an arthropod-borne epidemic.
  - *Risk Perception*—Very few mosquitoes are disease carriers, however, most people in a disaster environment will associate the presence of mosquitoes with disease even though their presence may be no more than a nuisance.
- ***Areas of Common Concern***—Whatever the disaster, certain areas are likely to need surveillance, to control vermin and vector proliferation. They include:
  - food areas (preparation, storage and eating);
  - refuse collection area and tips;
  - sanitary depots;
  - sewerage farms/depots;
  - damaged food premises, food manufacturers, food warehouses, coolstores, commercial kitchens, food storage areas;
  - damaged or destroyed poultry sheds, piggeries, stables;
  - dead stock/animals;
  - domestic kitchens (particularly box freezers or refrigeration which are buried under rubble);
  - burst sewerage pipes;

– damaged septic tank systems or domestic treatment plants, in particular those made with fibreglass or connected to PVC piping;
– areas/properties reduced to rubble; and
– any area where people accumulate.

INFECTIOUS DISEASES

Introduction

52. Emergency health workers must be aware of the need for vigilance in a disaster to prevent or control an infectious disease epidemic. Epidemics are rare following disasters in Australia, but can be common in less developed countries.

Public Perception of Disease Risk

53. In the immediate period following a disaster, unconfirmed stories of epidemics may be reported. It is essential that allegations be investigated and details obtained regarding:

53. the

- person reporting the incident;
- date, time and place of incident;
- persons affected;
- specific information relating to the effect of incident eg symptoms of illness, food consumed, suspected cause;
- who, when and how the appropriate authorities were notified; and
- active surveillance which should be undertaken by contacting health care providers to ascertain whether they are experiencing any increase in conditions or diseases above that which would normally be anticipated.

Risk Factors

54. Certain diseases such as malaria and cholera pose a threat after a disaster in areas where they are endemic. However, even if conditions are ideal for transmission, a disease cannot occur as a result of a disaster unless the causative organism is present before the disaster or introduced to the area during the disaster. The chance of a disaster-related infectious disease occurring in an area depends on the variables of:

- the existing pattern of disease; and
- the nature of the disaster.

Transmission Methods

55. Infectious disease can be transmitted by the following means:

- ***Air-borne***—Micro-organisms spread through the air from a source to a person (eg influenza, Legionnaires' disease and Q fever, meningococcal infection).
- ***Direct or Indirect Contact with Source***—Micro-organisms are transmitted from source to person, including transmission by body fluids (eg hepatitis B, leptospirosis and scabies).
- ***Water-borne/Food-borne***—Micro-organisms are carried in water or food and ingested (eg typhoid, cholera and hepatitis A).
- ***Vector-borne***—Micro-organisms are transmitted to a person by another host (eg Ross River virus, malaria and plague).

56. A table of diseases of special consideration is contained in Annex J to this Chapter.

Mitigating Transmission

57. Epidemic control measures should include:

- awareness of existing disease prevalence in the disaster area and evacuation/relocation areas;
- provision of appropriate sanitation and water;
- adequate control of disease vectors;
- maintenance of high standards of personal hygiene; and
- reduction of population density to reduce person-to-person contact.

Control Principles

58. One person should assume responsibility for the overall management of disaster-related infectious disease by applying the principles of:

- effective disease surveillance, through an awareness of probable infectious disease in the particular area, and vigilance in identifying all cases (a sample reporting form is contained in Annex K to this Chapter);
- prompt investigation of reported and rumoured outbreaks;
- timely feedback to appropriate authorities to facilitate the provision of adequate resources;
- implementation of appropriate control measures for the defined infectious disease risk; and
- on-going surveillance beyond the declared disaster period.

Specific Control Measures

59. Control measures for specific infectious diseases are documented in 'Control of Communicable Diseases in Man' (Benenson, 1991). These methods have been

adapted and field-tested under Australian conditions (Infectious Diseases Section, NSW Health Department; Infectious Diseases Unit, Department of Health and Community Services Victoria). Information about immunisation is documented in 'Immunisation Procedures' (National Health and Medical Research Council, handbook on Immunisation Procedures 1998 Edition 6).

PRINCIPLE

The chance of a disaster-related infectious disease occurring in an area depends on two variables, the existing pattern of disease, and the nature of the disaster.

SUMMARY

60. Accurate and timely assessment of public health risks following a disaster will enable a managed public health response.

61. Public health issues must be continually reassessed and priorities reallocated to respond to changing needs.

62. Public health control measures benefit both disaster affected persons and emergency service personnel.

63. Evaluation mechanisms must be an integral component of the response.

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Annexes:

A. Water Treatment
B. Emergency Accommodation Venues Information Checklist
C. Campsites
D. Mass Feeding Centres
E. Disinfection Dilution Factors
F. Emergency Toilet, Shower and Laundry Facilities
G. Recommended Number of Toilets, Showers and Laundry Facilities
H. Incineration
I. Disposal and Destruction of Animals
J. Infectious Diseases of Public Health Importance
K. Infectious Diseases Outbreak Reporting Form

WATER TREATMENT

1. **Raw Water**—This must be:

   - clarified; then
   - disinfected.

2. **Clarification**—This may be achieved by one of the following processes:

   - Allow sedimentation to take place (a very slow process);
   - Add a coagulation agent eg aluminium sulphate (alum) and allow water to settle. A simple jar floc test can assist in estimating quantity. If the water is acidic the addition of lime, sodium bicarbonate, baking soda, soda ash beforehand so that the pH is 7–7.5 may assist in coagulation; or by
   - Filter, either through sand (also a slow process) or through a finely woven cloth. If a storage is available, a sidestream filtration loop using a swimming pool filter powered by a diesel or electric pump will do a fair to excellent job.

3. **Disinfection**—This may be carried out by boiling or by the addition of chemicals, such as chlorine, as detailed below:

   - ***Chlorination***—Add in enough chlorine to give a concentration of 1mg/L (ppm) after 30 minutes contact time. It is recommended that an initial dose to give a concentration of 5mg/L (ppm) be added and maintain not less then 1mg/L (ppm) residual in the water after initial treatment. The quantities for 5mg/L (ppm) for 1000 litres are as follows:

CHLORINE DILUTION FACTORS

Water volume	**Chlorine Concentration required**	**Available Chlorine**	**Quantity of Chlorine to be used**
1000 litres	5%	4%	125 ml or 125 g
1000 litres	5%	12.5%	40 ml or 40 g
1000 litres	5%	65%	8 ml or 8 g
To determine the volume of a tank: Volume (litres) = R x R x H x 3140 (R = radius of tank in metres, H = depth of water in metres)			

   - Sources of available chlorine (read label on container)
     – *White King* or similar household bleach 4% approx
     – Liquid swimming pool or dairy factory chlorine (sodium hypochlorite) 12.5% approx
     – Granular pool chlorine (calcium hypochlorite) 65% approx

The chlorine level can be checked after thirty minutes using a chlorine test kit (there may be one at the local swimming pool). If none is available, make sure there is a strong smell of chlorine from the water.

- ***Water Sterilising Tablets (containing iodine)***—These should not be used continuously for more than a week because of the danger of iodine overdose. The addition of two drips of Tincture of Iodine (available from pharmacies) to 600ml of water, which is allowed to stand for 30 minutes, may be useful on a short term basis.

- ***Boiling***—Ensure a 'rolling boil' for three minutes.

4. Disinfection of Water Systems—Where the water reticulation system has been contaminated, it will be necessary to flush and disinfect all water pipes, including domestic systems, and empty all hot water tanks, and maybe normal external water tanks (both above and below ground).

EMERGENCY ACCOMMODATION VENUES INFORMATION CHECK LIST

Address of Venue:
Type of premises:
Owner: (Name)
Telephone: (BH) (AH) (M)
Facsimile:
Occupier: (Name)
Telephone: (BH) (AH) (M)
Facsimile:
Available camping/sleeping area (m^2):
Ground Surface:
Vehicle access to site:
Power available: ❑ Yes ❑ No
Sanitary Facilities:

	W/C	Urinals	WHB	Troughs	Showers
Male	❑	❑ ❑	❑	❑	
Female	❑	❑ ❑	❑	❑	

Laundry Facilities:
Wholesome water available: ❑ Yes ❑ No
If not connected to the sewer, state type of system:
Does septic tank require desludging: ❑ Yes ❑ No
Permanent Facilities: Hall (size):
Kitchen (list facilities):
Structural Soundness of buildings:
Other remarks:
Date: Assessed by:

CAMPSITES

Key Considerations

Should it be necessary to house people in tents, the following considerations must be taken into account in choosing a location:

- The site should be within reasonable distance of a safe and ample source of water, and downstream from sources of drinking water.
- The site should be away from mosquito breeding places and garbage dumps. It should have good access to roads.
- The topography of the land should permit easy drainage: the subsoil and ground water conditions should also be studied; and the site should be at a higher level than sullage and refuse disposal areas. Land covered with grass will prevent dust, but bushes and excessive vegetation that can harbour insects, rodents, reptiles, should be avoided or cleared.
- Wherever possible, the area should be naturally protected from adverse weather conditions eg prevailing winds. Narrow valleys and ravines subject to floods should be avoided.
- The site should be flood-proof, above high water level. If possible avoid areas with shallow water tables, otherwise the ground could become marshy in the rainy season.
- The site should be protected against landslides.
- The site should be easily accessible, not far from the centre of population.
- Areas adjacent to commercial and industrials zones, exposed to noise, odours, air pollution, traffic jams, and other nuisances, should also be avoided.
- There should be ample space for the people to be sheltered and for all the necessary public facilities. Generally, this means 3–4 hectares for every 1000 people (30–40 square metres per person).
- The tents should be arranged in rows on both sides of a roadway at least 10 metres wide to permit easy traffic. Between the edge of the road and the tent pegs there should be at least 2 metres.
- Inside tents there should be a minimum floor area of 3 square metres per person.
- There should be a minimum distance of 8 metres between tents, so that people can pass freely without being obstructed by pegs and ropes. This spacing also provides a safety measure against the spread of fire.
- Small tents for a small number of occupants are preferable. This point should be taken into consideration when planning for emergencies.

- In cold weather some heating appliances should be provided, and people should be instructed in their use and every precaution should be taken to prevent fires and explosions. Natural ventilation is adequate for tents.
- Suitable lighting should be provided for tents and roads.
- Garbage collection facilities should be provided.
- Showers, toilets, latrines and laundries should be located away from sleeping and food areas and handwashing facilities should be provided in conjunction with latrines.
- Drainage ditches should be dug around the tents and along the sides of roads.
- Water supply points should have adequate drainage to avoid mud and sludge or be provided over a hard stand or over raised boards.
- When camp sites are in use for long periods, the surface of roads should be treated to keep dust down.
- The camp should be divided into two separate areas: a residential area; and a community service area (mass feeding centre, field hospital, and recreation).
- For better management and control of communicable diseases, large camps should be avoided, or subdivided into independent units of no more than 1000 people.
- The camp site should be cleaned regularly according to a pre-arranged schedule.

MASS FEEDING CENTRES

Important Considerations

Some important points for the organisation of mass feeding centres are as follows:

- The location and layout of mass feeding centres should be identified to ensure reasonable sanitary safeguards.
- Whenever possible use should be made of existing buildings such as restaurants, hotel dining rooms, schools, public assembly halls and churches, which may offer suitable conditions eg. water, toilets, kitchen, power for maintaining a satisfactory standard of cleanliness, and protection against the invasion of rodents and insects.
- Only safe potable water may be used for drinking in feeding centres; where there is no piped supply, water must be transported, stored and handled in a sanitary manner.
- The source of the water must be known, as well as the means of conveyance of the water to the disaster site.
- A sufficient number of basins, each with soap, nail brush and clean disposable towelling must be provided exclusively for the use of food handlers.
- Separate basins should be provided for washing and rinsing eating and cooking utensils.
- Before washing, any grease or food scraps on the eating and cooking utensils should be scraped into a refuse bin.
- Serving of raw vegetables and soft skinned fruit should be avoided unless for dietary reasons: in such cases the vegetables and fruits must be thoroughly washed.
- Separate toilets for food handlers should be provided (if possible) close to work areas. Encourage non food handlers to use the general facilities.
- Refuse should be placed in bins that should be emptied regularly. The use of garbage bags is recommended.
- Separation of refuse into the following categories is recommended:
  - Putrescible—food scraps, fruit, vegetables.
  - Dry refuse—papers, cartons, cardboard.
  - Indestructible—tins, bottles and plastics.
- Where refrigeration facilities are non-existent or inadequate, perishable foods should only be bought on a daily basis and cooked and served as soon as possible.

- Condensed or powdered milk must be reconstituted with safe potable water only, and under the best possible sanitary conditions. If untreated milk is to used it must be boiled before being given to infants or hospital patients.

-

An adequate cleaning supply of detergents, disinfectants, brushes, clean cloths, brooms and other cleaning necessities must be provided.

- Disposable plates and cups should be used in mass feeding centres.

DISASTERS AND THEIR HEALTH EFFECTS

Hazard	Environmental Effects	Deaths	Severe Injuries	Public Health Consequences	Population Movement/ Evacuation
Earthquake	Building collapse. Disruption to utility supply. Heavy dust. Frequent fires and chemical spills	Many	Overwhelming	Loss of utilitieshygiene, sanitation Many homeless	Rare
Floods (slow moving)	Vehicles/caravans and buildings washed away	Few	Few	Water supply, hygiene, sanitation Risk of watervector-borne disease Many homeless	Common
Fires (bush or structural)	Devastation of crops, forests, pastures, structures. Smoke damage. Toxic gases.	Few	Few	Disposal of livestock.	Common
Cyclones (includes potential storm surge and flash flooding)	Damage to community infrastructure, residences, crops.	Windsfew Flashflooding/ surgemany	Windsmoderate (trauma from flying debris) Flashflooding/ surgefew	Water supply, hygiene, sanitation Risk of watervector-borne disease Many homeless	Common
Chemical (direct spill or leaching into soil and water table)	Contamination of water table/soil may occur. Fires. Air pollution.	Effect depends on toxicity, route of exposure and does for workers, rescuers, adjacent and distant communities. Cross contamination. Morbiditymay be chronic		Decontamination of casualties. Contamination of water supply. Long-term environment/health consequences.	Common

Terrorist-instigated event (explosive, chemical, biological, radiological attack)	Devastation of immediate environment Building collapse. Flying debris.	Many	Many	Restoration of utilities. Decontamination.	Rare (as required)
Transport (from human error, mechanical failure or terrorist action)	Disruption to transport. Fire Chemical spill	Multiple fatalities.	Many	May be significant mental health effects	Rare

CONSTRUCTION OF TEMPORARY TOILET, SHOWER AND LAUNDRY FACILITIES

TEMPORARY CAMPS FOR UP TO THREE DAYS

In temporary camps of up to three days duration the normal facilities used are:

- shallow trench toilets and urinals for disposal of human waste; and
- soakage pits with soap and grease trap for the disposal of sullage water.

Shallow Trench Toilets (*See* Figure 10F–1)—Shallow trench toilets consist of a trench 900 mm long by 300 mm wide by 600 mm deep.

This type of toilet requires very careful supervision by hygiene personnel to ensure correct usage and that the following rules are observed:

- Fouling of the surface of the ground and sides of the trench with faeces and urine must be avoided. Paper must be deposited in the trench and not allowed to blow about.
- The user must cover all excreta and paper immediately with earth, using a scoop provided for the purposes. Boots and hands must not be used for this purpose.
- Facilities for washing of hands within the vicinity of the toilets are provided.
- Five trenches are constructed for the first 100 persons and five trenches for each additional 100 persons.

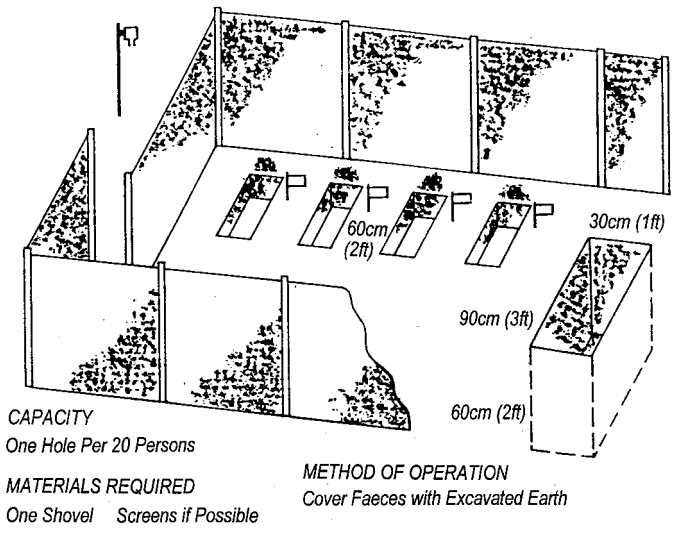

Figure 10F– 1: Shallow Trench Toilet

Shallow Trench Urinal—A shallow trench urinal consists of a trench 3 metres long, 1 metre wide and 750 mm deep. The soil in the bottom is then loosened for a further 150 mm but is left in the trench. The excavated earth should be heaped on three

sides of the trench and used to cover it when it is full. One such trench should be ample for 250 men.

TEMPORARY CAMPS EXCEEDING THREE DAYS

Shallow trench toilets and urinals are unsatisfactory in a camp of more than three days duration. Something of a more permanent nature is therefore needed. It is usual to provide:

- deep trench or bored hole toilets for disposal of faeces;
- funnel or trough urinals for disposal of urine; and
- cold water grease traps with soakage pits for final disposal of sullage wastes.

Deep Trench Toilet:

- ***General***—Deep trench toilets will be required at a rate of one seat for every 20 persons. The facility should be constructed so that they are fly and vermin proof. It is essential that they are provided with pedestal support ie heavy timber or star pickets. To prevent fly access or breeding in the toilet or at the base of the pedestal, oil sacking can be put in place, or alternatively by applying lime to the ground surface. This is the best method for camps of duration longer than a few days.
- ***Construction***—The following guidelines apply:
  - A trench **5 metres long by 750 mm** wide is excavated to a depth of at least 2.5 metres. The soil is placed not closer than 1.5 metres from the edge of the trench. **In cases where this depth cannot be excavated, the trench must be built up to obtain the required depth.** If there is any danger of the sides collapsing, they should be strengthened with **sand bags**, timber, or other means.
  - The ground all round the trench should be dug to a depth of 150 mm for a distance of 1.5 metres outwards from the trench and the soil removed. Strips of oiled sacking, 1.5 metres wide, should be spread over this area with the edge turned down over the side of the trench for a depth of 750 mm. It is then fastened to the wall of the trench with small wooden pegs.
  - A flyproof wooden structure is then placed in position, being supported by two heavy wooden beams along the front and back of the trench and extending beyond it, at each end, for a distance of 600 mm.

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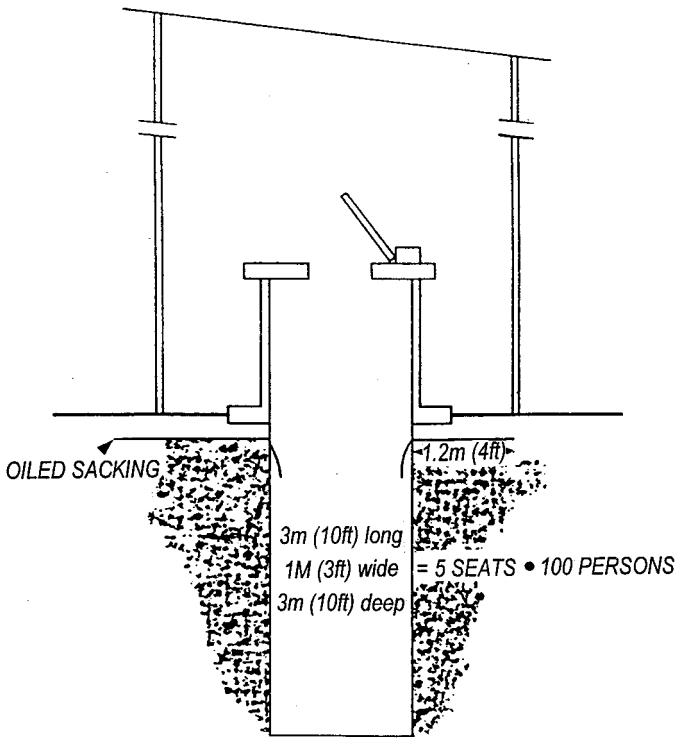

Figure 10F– 2: Deep Trench Toilet

– After being mixed with some **heavy oil** the loose soil that was removed is replaced on top of the sacking and rammed tight. This ensures that any fly larvae hatching out in the trench will be trapped under the **sacking** on attempting to reach the surface of the ground. The superstructure should be of **well seasoned tongue and grooved timber** and have sides built vertically and with the back sloped.

– The openings in the seats should have **close fitting lids** attached in such away that they will close automatically when not supported. A bar at the back that arrests the lid before it reaches a vertical position can effect this. The openings must be arranged above the centre of the trench and a sheet metal deflector placed to the front under each opening to deflect urine and so prevent fouling of the sides of the trench. Protection from the weather should be afforded with screening. Where a roof is provided, the lower edge should project well clear of the trench.

• When the trench becomes filled to within 600 mm of the ground level, the superstructure, screening should be removed to another trench prepared previously, the contents of the old one being then covered with oiled sacking, and the trench filled with earth, rammed hard and the site prominently marked.

Bored Hole Toilet—This consists of a 5 to 6 metre deep by 300 mm diameter hole and is prepared by a mobile auger. The top 1 to 2 metres is usually reinforced and fly proofing is carried out in a similar manner to that used for Deep Trench Toilets. A fly-proof structure should also be built over the top of these fixtures.

Funnel and Trough Urinals:

- ***General***—Where field toilets are in use, separate arrangements are necessary for the disposal of urine. The best methods are those by which the urine is disposed of directly into the ground as described below and shown in Figures 10F–3 and 10F–4.

- ***Construction:***

  – *Funnel Urinals*—Four conical metal funnels are built into a soakage pit, one funnel in each corner. The tops of the funnels are expanded and detachable strainers are inserted inside, about 75 mm from the top, or wide end, to trap cigarette ends and other debris. The **soakage pit** is a 1.2 metre cube filled to within 150 mm of the top with stone, rubble, perforated tins or similar material. These are covered with a layer of oiled sacking and the earth is replaced to ground level. The funnels may be constructed of sheet metal and are tapered from 300 mm diameter at the top to 50 mm diameter at the bottom.

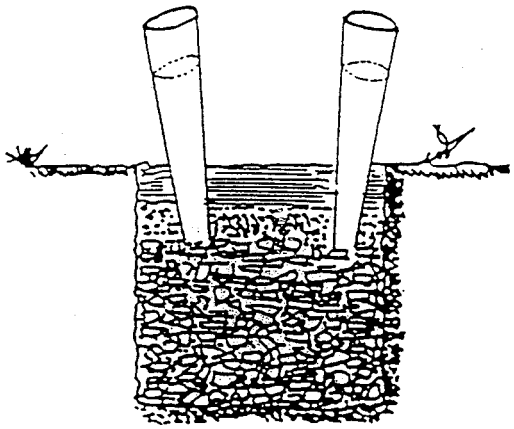

Figure 10F– 3: Funnel Urinal

  – *Trough Urinals*—These need to be properly constructed if they are to be kept clean and odourless (*see* Figure 10F–4).

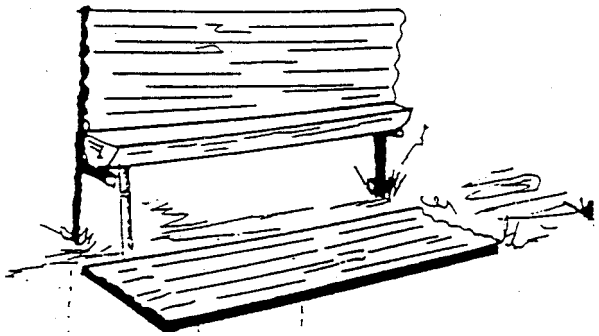

Figure 10F– 4: Trough Urinal

- ***Strainer Traps***
  - *General*—A suitable strainer is easily improvised, with grass, straw or similar material which will keep back some of the grease, soap or other suspended matter. The weight of a few large stones pressing down on the straining material will greatly increase its efficiency. The straining medium, together with the solids retained, can be disposed of by incineration or burial each day—more often if clogging occurs.
  - *Construction*—A strainer trap, suitable for temporary camps, consists of a perforated tin containing the straining material and fitted into another tin, which is connected to a soakage pit by means of a channel which also contains straining material.
- ***Grease Traps***
  - *Principle*—Grease in sullage is in suspension. If the hot water containing the grease is run into an adequate amount of cold water, the grease solidifies, rises to the top of the water and can then be skimmed off. This is the principle on which the cold water grease trap is constructed.
  - *Capacity*—It is important to note that the effective capacity of the grease trap must be sufficient to ensure that, water passing through it at one time—peak loads—will be cooled to a temperature at which ordinary cookhouse grease is solidified.
  - *Improvisation*—In instances where grease traps are not available one can be improvised quite simply by using a 200 litre drum or even a packing case.

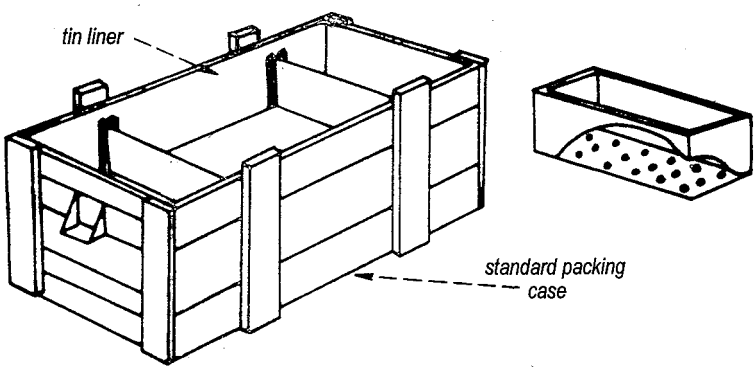

Figure 10F– 5: Cold Water Grease Trap

- ***Final Disposal of Waste Water***
  - *Soakage Pits*—Final disposal of waste water is, by preference, to a soakage pit that is of great value in field sanitation. Their purpose is to receive sullage water in quantities and to act as reservoirs from which the water can be absorbed continuously into the surrounding ground. The size of a soakage pit is 1.2 metres cube. If more soakage area is required, further soakage pits may be dug. The pit is filled up to within 150 mm of ground level with stones, as previously described when considering Funnel urinals.

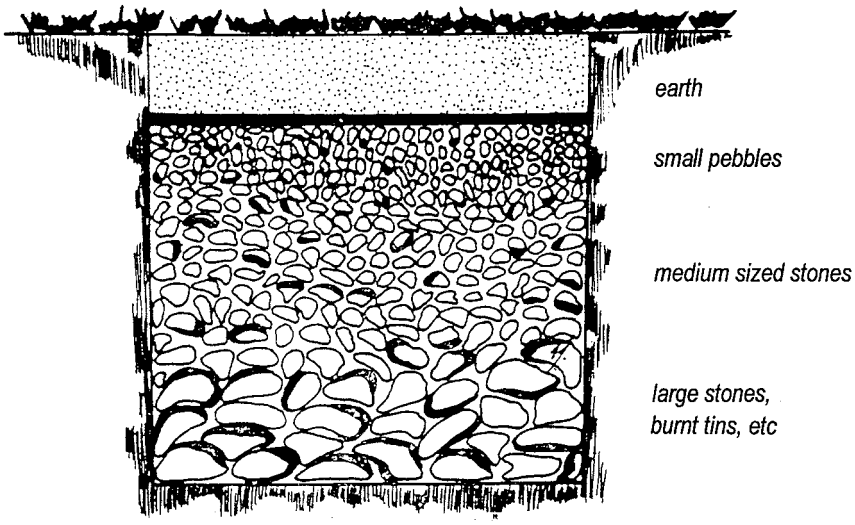

Figure 10F– 6: Sullage Soakage Pit

– *Reserve Pits*—The small amount of soap or grease that will remain in the water after attempts to remove them will ultimately form a coating on the sides and floor of the soakage pit and so prevent any further absorption of water. It is wise therefore, to have reserve pits available, particularly in clay soils where the absorption rate is slow. Soakage pits should be provided at each cookhouse, ablution, bathing place and laundry.

CONSTRUCTION OF SHOWER AND LAUNDRY FACILITIES

These can be provided by locating prefabricated facilities or by improvising. Refer to Figures 10F–7 and 10F–8.

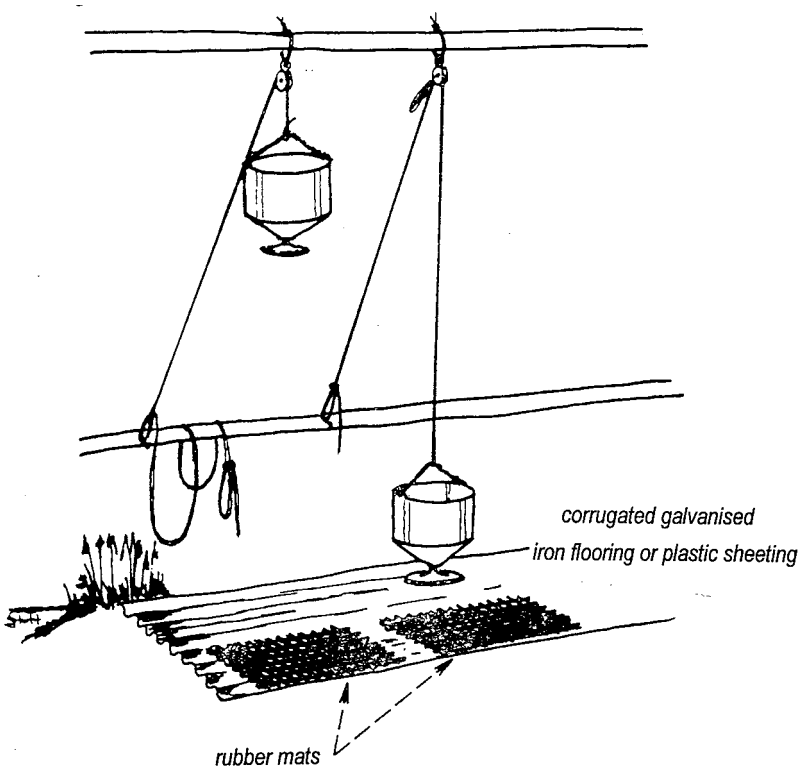

Figure 10F– 7: Improvised Showers

Hot Water—A simple method is through use of a 'put and take' heater which works on the principle that cold water must be put into the heater before hot water can be taken out. (*See* Figure 10F–8) A 200 litre drum is prepared as illustrated. It is filled with cold water and then heated. If cold water is poured down the funnel an equal amount of hot water will run from the pipe.

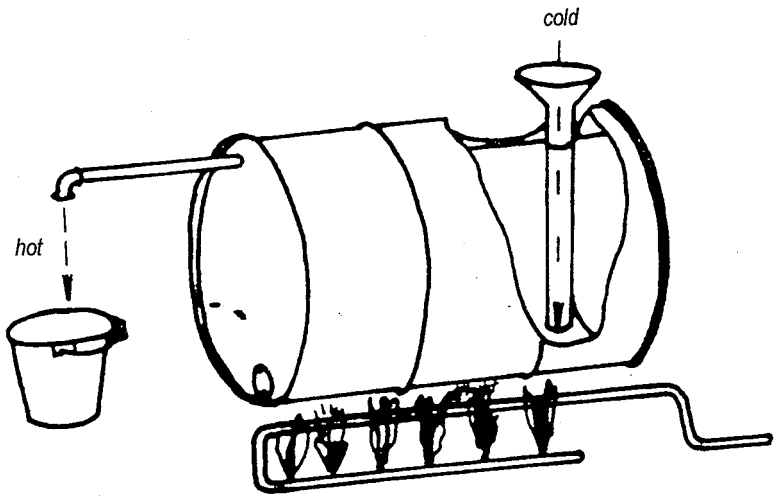

Figure 10F– 8: Put and Take Hot Water Heater

Maintenance of Ablution Facilities

- ***Temporary Toilets***—These should be maintained on a daily basis. Lime should be spread around the ground external to the pedestal in deep hole and bore hole latrines to prevent possible fly breeding areas. A bucket of water poured in the deep trench and bore hole latrines daily will assist in sludge breakdown.

  Note: Lime should not be put into the pits as this will adversely affect the bacterial operation within the pit.

- Adequate supplies of toilet paper should be provided and protected from the rain.

- Containers should be provided for the collection of sanitary napkins. These should be disposed via sanitary landfill

- ***Handwashing and Drying***—Hand washing and drying facilities should be checked daily to ensure an adequate supply of soap and clean water.

- ***Insecticides***—The limited application of residual insecticides may be required for the treatment of ablution facilities. In areas where the population is barefooted, the use of insecticides in lieu of lime, for fly breeding control, must be considered.

RECOMMENDED NUMBER OF TOILETS SHOWERS AND LAUNDRY FACILITIES

The criteria for ascertaining the number of facilities is contained in the Australian Building Code

Toilet and Washing facilities	Closets	Urinals	Washbasins	Showers
Males	1 per 20 persons	1 per 25 persons	1 per 30 persons	1 per 35 persons
Females	1 per 15 persons	N/A	1 per 30 persons	1 per 35 persons

Laundry Facilities

1 wash trough and a washing machine per 350 persons
1 clothes dryer or 25 m line per 350 persons
1 ironing board and power outlet per 350 persons

INCINERATION

Key Considerations

In the construction and siting of incinerators for the final disposal of refuse it is essential to observe the following points:

- The incinerator should be located away and downwind from the camp or temporary shelters.
- The incinerator should be built on an impervious base of concrete or hardened earth.
- The air inlet must be sufficiently large and it should be funnel-shaped, narrow end inwards to produce a blower effect.
- The fire bars should be placed loosely on their support to allow for expansion.
- The stoking gates should be suitably situated so that fresh material can be added from above.
- Whatever type of incinerator is used it is important to remember that:
  - final disposal by burial may be necessary to prevent the accumulation of matter that may be a source of media for fly propagation and sources of food supply for rodents;
  - burning off might not be possible if a bushfire risk prevails or in times of flooding; and
  - the creation of offensive vapours, odours or smoke plumes should be avoided where possible.

DISPOSAL AND DESTRUCTION OF ANIMALS

Factors for Consideration:

- Availability of sites suitable for burial or burning adjacent to the destruction site.
- Nature of soil/rock formation in the available area.
- Level of water table.
- Proximity to water catchment areas, bores and wells.
- Presence of underground services eg water, gas, electricity, telephone lines, drainage, sewerage, other improvements or structures.
- Proximity to built up areas and dwellings (particularly in the case of burning).
- Other weather conditions including prevailing winds.
- Availability of supplies of suitable fuel for burning.
- Presence of overhead structures such as power lines, these must be avoided when selecting both burial and burning sites.
- Quantities of carcasses and other material for disposal.
- Subsequent plans for the use of the area, eg soil may be unstable where burial pits are placed.

Advantages of Burying:

Burial is the preferred method of disposal because it is:

- quicker;
- cheaper;
- environmentally cleaner; and
- easier to organise (less outside resources required).

Burial Procedures:

- As a rule a 3 m wide and 5 m deep pit filled to within 2.5 m of ground level will accommodate 5 adult cattle per linear metre. One adult cattle carcass is equivalent to 3–4 adult sheep or goats, or 2–4 pigs.
- Carcasses and other material for disposal should be dumped on the side opposite the excavated soil. Portable yards in which sheep are destroyed, may be located at the side of the pit. The abdominal cavities of all animal carcasses must be opened prior to placement in the pit. Carcasses of

horses and pigs should be slashed widely-open using long handled bill hooks or short barred chainsaws.

- The operation should be undertaken at the side of the pit to minimise contamination of the other areas. **Under no circumstances should personnel enter the pit**.

INFECTIOUS DISEASES OF PUBLIC HEALTH IMPORTANCE

Disaster setting	Disease category	Control Measures
Cyclone Flood Fire Earthquake	**Food-borne disease** Campylobacter Infection Salmonellosis Shigellosis Staphylococcus Typhoid/paratyphoid Viral Gastroenteritis Bacillus Cereus Hepatitis A	Controlled food hygiene practices Treatment of close contacts
Flood Cyclone Earthquake Fire	**Water-borne disease** Cryptosporidiosis Leptospirosis Campylobacter Infection Cholera Typhoid/paratyphoid Viral Gastroenteritis	Treatment of water supply Hygienic disposal of human waste Protection of water supply from contamination from animal sources
Flood Cyclone Earthquake Fire	**Vaccine preventable disease** Tetanus Measles Pertussis	Immunisation Immunisation Treatment of close contacts
Floods Cyclones	**Vector-borne disease** AAE Ross River Virus Japanese Encephalitis Malaria Typhus	Breeding site control Vector control Public information Improve living conditions and standard of hygiene
Cyclone Flood Fire Earthquake	**Respiratory disease** Tuberculosis Influenza Streptococcal Disease	Screening of contacts Treatment of cases
Cyclone Flood Fire Earthquake	**Person to person spread** Hepatitis A Viral Gastroenteritis Scabies Streptococcal Disease Staphylococcus Shigellosis Meningococcal Infection	Treatment of contacts Education on good personal hygiene Treatment of cases Immunisation

INFECTIOUS DISEASES OUTBREAK REPORTING FORM

Date ___/___/___ Interviewed by _____

Name _____

Address _____

_____

Phone Number _____

Symptoms: What symptoms have you had?

diarrhoea	nausea	vomiting	adominal cramps
headache	fever	blood in faeces	joint or muscle aches

other _____

When did the symptoms first start? Date ___/___/___ Time ____ am/pm

Do you know of others who have been ill with similar symptoms? Yes/No

(Include names and contact details for others for further follow-up on reverse side of form)

Have you been in contact with recreational water supplies?

pool	spa	river	lake

other _____

Do you suspect anything that may have caused your illness? Yes/No

(explain)

Note: Keep this form for review or collection by the supervisor or public health officer. Report anything suspicious or report if several cases report similiar illness within a short period of time.

(For use at first aid posts, accommodation centres)

CHAPTER 11

MENTAL HEALTH

INTRODUCTION

1. The mental health effects of disaster are now better understood as there has been substantial scientific research examining the impacts for affected persons, communities and workers. Within this research the mental health consequences have been shown to be significant and may interfere with the capacity for recovery. While the majority of those involved will recover, the severity of the disaster, particularly in terms of the numbers and nature of deaths and the level of destruction of community, will contribute to more adverse outcomes. In addition, disasters that are the result of human malevolence or negligence are likely to bring additional stress that will further complicate recovery.

Preparation and Training for Disaster Response

2. Education about possible disaster experiences and how to deal with them, training through disaster exercises, and awareness of likely psychological reactions in the self and others are all helpful. This will increase the individual's and the community's capacity to respond appropriately, to recognise and deal with stress effects and will lessen the likelihood for adverse outcomes from these. Including the mental health response in disaster training is relevant for all workers. There is evidence that those who are trained and experienced may be less likely to suffer post-disaster psychological morbidity.

Warning and Threat

3. These are the early phases of recognition that a disaster is imminent. Anxiety rises in response to this knowledge, although some are likely to deny its significance with attitudes such as 'It can't happen here, to me'. **Accurate and simple information** from **trusted sources** is most likely to be effective. Regular updates and guidance as to what to do to protect oneself, one's family and property, will enhance the capacity to deal with disaster impact. This is likely to lessen the level of shock and helplessness.

Disaster Impact

4. Shock and feelings of fear and helplessness are common reactions to the disaster impact. These responses are particularly likely if there was no period or warning, but simply sudden impact – for instance with an earthquake, or mass shooting. Intense fear and horror may temporarily make the person unable to act. Cognitive distortions, particularly of time, and sense of reality may occur. A small proportion of people may continue in this dazed state, often with feelings of unreality, well beyond the time of the impact. They may require **support and protection** as otherwise they may place their lives in further danger. Panic is

rare, but more likely in situations of ongoing or worsening threat, and narrowing chances of escape – for instance during building fires. Management during the impact is usually provided by those directly affected, and the **majority of people respond in effective ways**, some showing strong leadership.

Immediate Post-Disaster Period

5. This is the phase where there is recoil from the impact and the initial rescue activities commence. Initial mental health effects may appear eg people show confusion, are stunned or demonstrate high anxiety levels. It is also a time to assess the likely short and longer term effects and to start to make provision for these. For instance, assessment of the numbers of deaths, injuries and destruction of the community will provide a indication of the degree to which the population affected has experienced personal life threat, injury, the gruesome and mutilating deaths of others; the losses of loved ones, home and other valued possession; the disruption of and dislocation from family, community life, neighbourhood and even work. These events constitute the main stressors that will contribute to adverse mental health impact and indicate those at risk and likely to be in need of specific mental health support. The recovery environment will also be significant, ie as to whether it is supportive and acknowledging versus rejecting or unhelpful.

6. The primary helping response at this time should be of **psychological first aid**. This aims, like other first aid, to sustain life, promote safety and survival, comfort and reassure, and to provide protection. It does not involve probing those affected for their reaction but rather provides a **calm, caring and supportive environment** to set the scene for psychological recovery.

ACUTE PHASE INTERVENTIONS

Support for Affected Populations

7. A range of support programs will need to be developed for the affected populations in the acute phase. These may have a significant positive effect on mental health outcomes if well organised and responsive to different needs.

Information Provision

8. Provision of information is critical to recovery, both in practical terms and because it can diminish levels of stress. It needs to be **simple**, **accurate**, assist with the **registration** of those affected, and provide information on the whereabouts of others as soon as this is available. It will also provide a structure within a period that often seems confusing and chaotic. It is particularly important for advising **what to do**, and for those **separated** from family members. There should be one main source of information and those involved in gathering and providing it, should be sensitive to its psychological as well as practical significance.

Emergency Support and Triage

9. Emergency support and **triage** is for those who are distressed, or otherwise acutely affected, or demonstrate a disturbed mental state. This process can link them into either support or protection if still on site, or if appropriate to emergency medical/mental health care. This may involve general supportive counselling, advice if required, an opportunity to talk (only if the affected person needs to) and reassurance. Triage can support people to move from the disaster site. It can also ensure that those likely to be at higher risk are provided with necessary intervention or care and **linked to follow-up**.

Bereaved People

10. Bereaved people need specific support such as information about what has happened, opportunity and support to **see the body of the deceased** where this is possible, linkage to others who can assist them practically, and emotionally. Where there have been mass deaths, for instance with an aircraft crash, or accident, it may be helpful for them to be near or visit the site, be **supported** in a group and protected from intrusion (eg media). As these are high-risk bereavements, they are likely to need **later-focussed skilled bereavement counselling** in the weeks that follow. Debriefing is inappropriate for this population.

Disaster-Affected People Who Have Been Psychologically Traumatised

11. While disasters are very distressing, the majority of people do **not** develop post traumatic stress disorder or other morbidity. However those who have experienced severe life threat personally, who have been exposed to the shocking, mutilating deaths of others or who have been severely injured, may be at high risk, particularly if an intense level of arousal continues, or if they have experienced dissociation (sense of unreality, feeling as though not there, numb feelings). There is no evidence that debriefing will prevent the development of PTSD for this group. Nevertheless, as individuals, or as a group whose members have been exposed to the same thing they may need the opportunity to discuss what they have experienced, or simply gain support from one another. This may be referred to as **natural or supportive debriefing**, but it does not involve active re-exposure to, or forced discussion of, the traumatic experience. If people demonstrate a need to talk through what has happened this can be supported naturally. People in such circumstances are likely to need **later specialised focussed trauma counselling** provided by skilled mental health professionals in subsequent weeks, but not immediately. The first task is to support their psychological survival strategies, and facilitate individual ways of coping to allow them to recover.

Those Who Have Lost Home, Community or Place of Being

12. **Shelter** and protection will be the first tasks, and ensuring family members and neighbourhood are **kept together** as far as is possible. Subsequent management requires a recognition of the separation distress, grief and anxiety

that is involved and aims to provide linkages to others to promote **social support networks**. Where possible it will be helpful to **involve people** as far as possible in the **plans for their own recovery** and that of the community.

Emergency Workers and Rescuers

13. These groups may also themselves be affected by their experience in the disaster. Training and preparation may mitigate effects but some factors may increase the risk of post disaster morbidity. Workers are sometime known as the 'indirect or secondary' victims. When there are many shocking and gruesome deaths, the deaths of children, with frustration or inability to fulfil rescue tasks, or excessive and prolonged tours of duty, workers may be vulnerable. These experiences are at times defined as critical incident stress. Appropriate briefing and psychological preparation beforehand are likely to mitigate stress effects. Appropriate **stress management programs including psychological or critical incident stress debriefing** may be perceived as helpful, but have not been shown to prevent Post-Traumatic Stress Disorder. These will not be appropriate for everyone and should never be mandatory. Such support may be provided **alongside operational debriefing** by trained team leaders, or as part of a comprehensive mental health program provided by appropriately trained mental health professionals. This type of intervention should be part of an overall management and follow-up program **integrated with other occupational health initiatives**. Later follow-up and **individual specialised counselling** is likely to be required for workers if they have persistent problems and has been demonstrated to be effective.

LONGER-TERM INTERVENTIONS

14. Post-disaster mental health effects may appear in a number of different patterns. These may be related to particular stressful experiences or may be generic. Furthermore, some effects appear early in the post-disaster period. Others may be delayed. Some may become chronic. Earlier problems may also reappear.

15. The commonest post traumatic morbidity appears in the form of **post-traumatic stress disorder or major depression**. The likelihood of these problems is as noted above, directly related to the severity of life threat and exposure to death type stressors and significant losses. PTSD has three main groups of symptoms: intrusive memories, nightmares and reexperiencing of what has happened; avoidant symptoms, numbness, loss of feelings; heightened arousal and irritability, sleep disturbance and startle effects. Concentration may be impaired. This disorder can vary from mild to severe, and fluctuate over time. It can affect personal relationships and the capacity to work. **Trauma-focussed counselling** in the form of **cognitive behaviour therapy** may lessen the risk if applied after the first few weeks for those experiencing early intense distress in this form, or can provide an appropriate model of care if there is an established problem. Referral for psychiatric assessment and early treatment is appropriate if this disorder is established.

16. **Depressive** feelings are common in the post disaster period, especially if there has been substantial loss and destruction, and as it becomes obvious that recovery is complicated and may take a long time. These may merge into depressive illness, especially for those who have had a previous episode, or are vulnerable from loss or trauma or dislocation. Appropriate treatment may involve **focussed cognitive-behavioural or interpersonal counselling**, targeted to individual needs, and if **severe, antidepressant medication**.

17. **Anxiety problems** such as fears associated with reminders may also develop, and will require behavioural therapy if they do not settle. **Substance use** problems may also arise in the post disaster period, and usually represent a way of trying to deal with high levels of anxiety or arousal. These should be managed alongside treatment of underlying distress or symptoms.

18. **General symptoms** and on-going vague distress, and **somatic symptoms** may lead to frequent presentations to health care systems, and particularly to **general practitioners**. A full health check is important and a careful history may help to link them to the experience of the disaster. This awareness may facilitate recovery, or **focussed counselling** may be needed. It should be noted that **adverse physical health outcomes** may also result from the disaster experience. These should appropriately assessed and managed as well.

19. **Groups** that arise **spontaneously** (eg self-help) or that are **coordinated** professionally can be helpful for people who benefit from sharing experiences and developing a support network with '**others who have been through the same thing**'.

20. **Recognition** of what those who experienced the disaster have been through can be helpful to them in having their distress acknowledged and is seen as supportive. The broader community, schools and workplaces can be helpful in this regard. **'Grief' leadership** and acknowledgment of need by political and community leaders can be particularly helpful, the more so if **emotional support** is provided. Promises of restitution are often given in the early phase but should not be made if they cannot be kept.

21. Disasters involve the **whole community** and the **social system** to greater or lesser degrees. This may mean that there is an impact on the broader community organisation. Sometimes this is positive and helpful in resolving the experience and moving forward. At other times there may be scapegoating and a degree of community breakdown. **Support** for leaders, opportunity for **involvement of the community in its own recovery**, and community renewal and **memorialisation** can help. In the acute phase there is often a positive response – called the honeymoon period – but this may give way to disillusionment which creates extra stresses through the long period of recovery, and may be even more difficult to adjust to than the acute event.

22. **Expectation of recovery** and **support for this** should allow individuals to move on from what has happened, with recognition that it will not be forgotten,

and cannot be undone, but will eventually be incorporated as part of experience in the past.

GROUPS WITH PARTICULAR NEEDS

Children and Adolescents

23. **Children** may be affected by disasters in ways that are not immediately obvious. In severe life-threatening circumstances, for instance a mass shooting incident, they may develop traumatic stress reactions if personally threatened; depressive reactions if experiencing the loss of someone close; anxiety reactions if separated from family. Some of these reactions will appear early, however reactions in children are not infrequently delayed. In natural disasters children are often anxious about separation, and may require **parent support** to progressively deal with fears. If children have been bereaved they require support to share grieving rituals and as well the ongoing security and care of family as far as is possible. Traditional debriefing is inappropriate for children. **Some supportive** programs in terms of **group discussion** can be helpful, as can **structured** programs in **the school environment** which aim at helping children to deal with their experiences (eg work books about the disaster). For children who have been severely affected **individual clinical counselling** to deal with trauma and grief may be necessary as well as specific programs for their parents. Parent/carer response is a major factor which influences outcomes for children, as parents and other family members must also be supported.

24. **Adolescents** may also be severely affected, but like children may not show their reactions, although these may not be very different from those of adults. They may use denial, but can also be assisted by **supportive programs** in school or other settings which assist them in making meaning of their experiences. The confrontation with the reality of death may be particularly stressful. If affected by major stressors as above they may also need **focussed clinical counselling** to deal with trauma or loss, especially if at high risk of developing morbidity.

Refugee and Migrant Populations

25. These populations may be particularly vulnerable because of language difficulties, uncertainty in a new country, and effects of the disaster in reawakening earlier traumatic experiences. **Language and culture** sensitive **information** and response, **structures** that are **reassuring**, and provision of **counselling** by those with appropriate skills, can be helpful. Support for these communities to help their own members will also be of value.

Older People

26. It has been traditional to suggest that older people may be more vulnerable. Evidence suggests that this may be more to do with their difficulties in moving and leaving a home that is threatened, for instance, and if much is lost, or feelings afterwards that it is ‘not worth going on’. Practical support, counselling,

and sensitivity to the possible development of depression are all important. A deterioration in physical health can sometimes follow. Older people may **hesitate to take up assistance offered** because of their need for independence and a feeling that 'others need it more'. Thus they may require quite specific **outreach**, and **holistic health and mental health interventions** to help them deal with the disaster experience.

SUMMARY

27. Firstly, there should always be a **positive focus** on and belief in the **capacity for recovery**. The majority of people do not suffer adverse consequences and **many grow personally** through their handling of the experience. The majority of people will recover without **mental health** problems. While everyone should have general support and access to mental health programs if needed, these should be **focussed** on those at **higher risk** and with **greatest need**.

28. **Psychological first aid** should be the most immediate response.

29. **Information** is psychologically valuable and should be recognised as part of the mental health intervention spectrum.

30. **Supportive counselling** can be provided to anyone acutely distressed and involves: comforting, and reassurances; practical advice; allowing the person to discuss their experience, but only if they feel the need to do so; linking them to support networks; and identifying those at risk who may need follow up and specialised clinical counselling.

31. **Supportive or natural debriefing** is the provision of opportunities for naturally occurring groups to discuss and go through their experience, for example with others who have had similar experiences in the disaster. Mutual support, relief, shared meaning, and opportunities to identify further needs can be provided in this type of context. This may be integrated with operational debriefing. Supportive or natural debriefing should never be mandatory. It does not imply psychological damage or trauma and does not probe or demand that members of the group discuss their experience or express their feelings. Care should be taken if this is offered formally to ensure that the group is of those who have had similar experiences, and that there is no suggestion that it stands in place of programs designed to meet individual need. Natural debriefing may occur also in teams as they talk through their experiences, in families, neighbourhoods, and communities. While it is perceived as helpful it is not helpful to everyone as there are many different coping styles. It should be recognised simply as one form of support.

32. **Critical Incident Stress Debriefing** is a formalised structured method of group review of the stressful experience of a disaster. It has been developed only for emergency and formal rescue workers and may be helpful to these if integrated with previous training, briefing, and stress management programs in an occupational health and safety framework. While it has not been shown to prevent PTSD it may assist with sustaining function and general wellbeing. There is no evidence that it is either appropriate or beneficial for broader

disaster affected populations. Available evidence shows that it may in some instances add to the traumatic experiences, or possibly complicate recovery, so it should not be widely used and is only appropriate, if at all, for operation emergency services. It is quite inappropriate for acutely bereaved persons.

33. **Psychological debriefing** is another form of debriefing. There is a range of modalities, many of which have a positive focus, family focus or focus for specific incident types. Like critical incident stress debriefing, it is extensively provided, but with no evidence of any capacity to prevent psychological morbidity in broader populations. While both are frequently perceived as helpful, these perceptions of helpfulness do not correlate with improved outcomes.

34. **Clinical counselling** is provided by mental health clinicians with expertise on the assessment and management of people at **high-risk or adversely affected by severe stressors** such as those experienced in a disaster. It may be **general** trauma focussed (**trauma counselling**) or bereavement focussed (**bereavement counselling**). Specific forms have also been developed for **children**. It requires a **specific assessment** of need, which may be carried out through a careful and therapeutic process of exploration of the individual's experience and may utilise **specific screening**. It is usually best provided in the early weeks rather than immediate days post disaster.

35. **Psychiatric assessment and treatment** should be available for those who develop specific disorders in the post disaster period. It is important that assessment and intervention are offered early, before disorder and any associated disability become consolidated. These services are part of the mental health response and should link to longer term care as necessary. Previous disorders or problems may re-appear at the time of a disaster, with the problem being inappropriately attributed to the disaster stressors. Clinical assessments can help to clarify this for both counselling and treatment.

36. **Community based interventions** range from **consultation with disaster and community leadership** to encouragement of supportive post-disaster environments, networks of support, information and ceremonies (eg memorial) to facilitate recovery. They may also be focussed in particular settings – eg workplace, schools, local government area, shelter accommodation sites.

37. **Long-term management of post-disaster mental health** morbidity should be folded into other mental health response. Longer term problems are best dealt with through general programs of this type.

38. **Hopefulness** is one of the strongest predictors of post-disaster mental health outcome. It should be encouraged in both those providing support, and those affected. There should always be a **recognition of strengths alongside vulnerabilities**, and any interventions should build on these strengths as well as lessening vulnerability. While the realities of traumatisation and vulnerability must be recognised, effective interventions exist in terms of both trauma and grief counselling, and have a demonstrated capacity to lessen post-disaster morbidity. These are specific interventions and training mental health

professionals to provide them in effective ways is critical. It should be noted that **natural recovery processes** are present to varying degrees for all those affected and that these should not be interfered with, but be **facilitated**. It is also important to recognise the timing of need for intervention may vary, with individuals, and initially there may be a greater focus on psychological and physical survival. It may only be when these are assured that the person can benefit from counselling.

REFERENCE

39. The reference used in the Chapter is as follows:

- Solomon, S.D. (1999). **Interventions for acute trauma response**. Current Opinion in Psychiatry, 1999, 12:175-180. Lippincott Williams & Wilkins.

CHAPTER 12

POST–DISASTER ACTIVITIES

INTRODUCTION

1. There are a number of activities that may need to continue well after the response phase of a disaster. Many of these are initiated during the response, but some recovery aspects and research may continue for many years after the event.

EQUIPMENT

Replace and Repair

2. Equipment disposed of during the response must be immediately replaced, damaged items repaired, and equipment lists reviewed in the light of recent experiences.

Equipment Requests

3. Following every disaster requests will be received for additional equipment. These must be critically evaluated, as the next disaster may be different.

DEBRIEFING

4. Health professionals are involved in both single service and multi service operational de-briefs. As well as initiating psychological de-briefing and defusing for their own service, they may be asked to assist with other responders and victims.

REVIEW OF PLANS

5. Health professionals must be involved in the review of both main and functional plans following activation. Procedures should be reviewed and modified as required and disseminated to all users.

DOCUMENTATION

6. Quality documentation is essential for medical legal requirements, clinical management and research. Research should include mortality/morbidity studies. Tools such as Injury Severity Scoring (ISS) and the Abbreviated Injury Scale (AIS) could be considered as beneficial parameters for research and clinical audits.

7. Following a disaster there may be a wide range of inquiries requiring input from health and medical professionals. These include governmental, judicial, forensic, and insurance investigations. This reinforces the importance of timely

and accurate recording and the storage of all documentation for the required length of time.

EDUCATION AND TRAINING

8. The lessons learned from each disaster should be widely disseminated and incorporated into future planning and educational initiatives. Appropriate research should be encouraged and funded. The results of validated research should then be used to enhance education and training and such information should be shared both nationally and internationally.

REHABILITATION

9. Early involvement of appropriate experts in rehabilitation is very important for the management of both the individual and groups of disaster affected persons.

RESTORATION OF NORMAL FUNCTIONS

10. During recovery activities it is vital that work be undertaken to restore the infrastructure of the community and provide for the disaster affected people to return to their normal lifestyle as quickly as possible.

11. The desire of disaster affected people to 'return home' will add considerable pressure to people working on restoration, however it is important that areas be considered safe before affected areas are re-occupied.

Minimising Physical and Emotional Health Impacts

12. In the recovery process, there is an obligation to minimise the impact of the emergency upon the physical and emotional health of the community and to ensure the rapid return to optimum community standards. The Health Department in each State and Territory has a legislated responsibility for the health of the community. Attention is drawn to the Australian Emergency Manual—Disaster Recovery on this subject.

RIGHTS OF ACCESS

13. Emergency workers need to consider the rights of affected persons to have access to their property to recover personal belongings and the need to allow insurance assessments to take place.

SAFETY ASSESSMENT

14. An assessment of the safety of an area may include:

- immediate danger arising from the disaster;
- stability of the buildings;
- safety of roads and bridges;

- availability of water;
- accessibility of disaster area for emergency workers to provide services; and
- availability of sewerage or alternative liquid waste disposal.

SENSITIVITY AND CONSULTATION

15. When people and communities face the tasks of putting order in their lives, restoring their losses and establishing normal living patterns, their capacities to recover using their own resources will vary depending on the specific circumstances of the disaster. Consequently the responders have to adapt the assistance provided, to most appropriately meet the needs of those affected. This requires sensitivity to the situation and extensive consultation with affected people and communities.

EMOTIONAL IMPACT

16. Typically, emergencies result in the destruction of property such as homes, personal possessions, income earning assets and community facilities. Emotional distress and feelings of disorientation usually accompany these physical losses.

17. The physical and emotional impact of an emergency may diminish the recovery capacities of individuals, families and communities to the extent that assistance from outside is usually required.

18. It is important that such assistance does not overwhelm affected people and detract from their involvement in managing their own affairs. Assistance commonly includes material aid, temporary accommodation, financial assistance, counselling and personal services, information and community support.

THE RECOVERY PROCESS

19. Having regard to the above, the recovery process may be complex, as people and communities will have a variety of needs which will require numerous recovery measures involving a wide range of agencies. Such measures will be dynamic, to the extent that needs will constantly change over time as difficulties are overcome and new issues arise, and protracted, given that the full recovery process may take several years to complete.

Self-Determination

20. Experience demonstrates that recovery is best achieved when affected communities exercise a high degree of self-determination. It should be seen as a developmental process through which communities attain a proper level of functioning.

SPECIFIC RESTORATION REQUIREMENTS

21. Specific restoration requirements will vary greatly depending on the type of disaster eg in the event of a flood, major infrastructure work including the restoration of sewerage, water services, roads, bridges, power, communication, buildings and tips is likely to be necessary.

FLEXIBILITY

22. As each disaster will be different, emergency workers must be flexible and alert to the priorities and the needs of the affected population during the recovery stage.

SUMMARY

23. The activities of agencies and the community continue well after the response phase has passed.

24. Debriefing and finalisation of documentation will provide input into review of plans and enhance future education and training.

25. Post disaster activities should enable the community to have direct input into the recovery process.

REFERENCES

26. Reference for this Chapter is as follows:

- Emergency Management Australia: **Australian Emergency Manual—Disaster Recovery 1996**
  (**Note:** 2nd edition due for publication mid-2000 to be known as Australian Emergency Manuals Series, Part III, Volume 1, Manual 3—Disaster Recovery (2nd edition)

CHAPTER 13

OTHER RESOURCES

INTRODUCTION

1. By definition disasters cannot be managed through the routine procedures and resources of the community. Counter-disaster measures require assistance from all possible sources.

2. There are a variety of resources and ancillary services available from individuals, private organisations, State and Commonwealth government bodies. These can be accessed through the normal lines of communication but the value of local knowledge and networking should not be underrated.

3. The ambulance services and local hospitals fall into State and local disaster plans and are not considered in this Chapter.

4. The requirement for, and use of, additional resources will depend on local assets, and may vary considerably between remote and populated areas. Volunteers and community organisations are much more likely to be used in rural and isolated areas.

PERSONNEL

5. It is important that volunteer efforts are supervised and coordinated within the total medical disaster plan by the appropriate Medical Controller. These available services include:

- local health care professionals;
- first aid organisations;
- non-government organisations; and
- other voluntary groups.

Local Practitioners

6. Medical practitioners and nurses may have clinic facilities and equipment in or near the disaster area. They will normally be able to assist with resuscitation and further treatment, and continue management of those who do not require further admission to hospital. Rural general practitioners are usually substantially involved in disaster responses in country areas, whilst in metropolitan areas availability of emergency services will usually limit their participation.

7. The contribution of local health practitioners is maximised by appropriate planning and liaison.

First Aid Organisations

8. St John Ambulance Australia - Operations Branch (formerly known as the St John Ambulance Brigade) and the Australian Red Cross can contribute personnel, equipment and other supplies. Volunteers trained in first aid will be able to assist in dressings, stabilisation of fractures, observation of casualties and some transport. Other organisations with voluntary first aid capabilities include the Surf Life saving Association and certain community groups.

Australian Defence Force

9. The Australian Defence Force (ADF) has health personnel and other assets which may be available in the appropriate circumstances. A majority of personnel in the Defence Force have received first aid training ranging from paramedical to basic first aid. These health assets are detailed in Annex A to this Chapter.

Royal Flying Doctor Service

10. The Royal Flying Doctor Service of Australia (RFDS) provides a comprehensive network of aeromedical evacuation resources servicing rural and remote areas. This includes a radio network which can be connected into the Telstra network, supplies of drugs and dressings in isolated areas, medically dedicated aircraft and staff. Bases within Australia are detailed in Annex A to this Chapter. Similar services are provided in the north of the Northern Territory by the Northern Territory Aerial Medical Service.

11. Other patient aeromedical evacuation organisations exist in some states including air ambulance operations, emergency medical and helicopter services. These organisations can provide aircraft, monitoring equipment and mobile medical teams.

BLOOD TRANSFUSION SERVICES

12. Although practices exist in a disaster to prevent blood and blood products from being wasted, whole blood may still be required for resuscitation of casualties. Urgent collection, supply and transport of products to the disaster site or hospital may be required.

13. The Australian Red Cross Blood Service (ARCBS) provides a safe and reliable source and should always be involved in the provision of blood and blood products. ARCBS has a National Office and five Business Units covering all the states, and can plan and provide for additional blood and blood products supplies on a larger scale. Appeals for blood during the actual disaster can cause more problems than they solve.

Other

14. Medical personnel and equipment are available from a variety of other sources, both private, industry and governmental. Ships and aircraft contain certain basic

medical equipment sets and many ships carry antidotes, detoxification and hazardous materials handling equipment.

15. Airlines such as QANTAS and Ansett Australia, carry medical kits and larger airports **should** have access to stored first aid supplies.

REMOTE AREA ASSETS

Royal Flying Doctor Service

16. The Royal Flying Doctor Service provides medical and communications services to remote areas of Australia.

RFDS Medical Chests

17. Approximately 4000 RFDS medical chests are located throughout rural and remote parts of Australia. These chests contain a range of dressings and pharmaceutical including S4 and S8 poisons (prescription only medications and narcotic analgesics). The chests are designed only to meet the routine and emergency needs of small numbers of patients. They allow continuing medical care to small communities which may become inaccessible as a result of natural events such as flooding or cyclones.

Visiting Medical Services

18. The RFDS currently has aircraft, medical and nursing staff based at 14 national locations. These are listed at Annex A to this Chapter. A visiting medical service, consisting of primary care clinics, visiting specialists, public health teams and allied health professionals, is provided to numerous small communities on a regular basis. These services can be extended to provide additional routine medical care to disaster affected victims in remote areas, provided that suitable airstrip and flying conditions still exist.

HF Radio Network

19. The communication service is based on an HF radio network and large numbers of outpost radio stations and mobile HF sets exist across isolated areas. Many remote area emergency service vehicles (ambulance, SES, police and RFDS aircraft) have the RFDS network frequencies, as do isolated nursing posts, hospitals, pastoral stations, roadhouses and mine sites. Whilst the telephone has now become the predominant form of communication in these areas, most of these radio sets are maintained for emergency use, and make possible universal communication between hospitals, emergency services and remote locations in the event of an accident or disaster.

20. HF calls can be connected into the telephone system but quality of HF radio is not always good. (*See* Australian Emergency Manual—Communications).

Northern Territory Aerial Medical Service

21. This service provides similar services to the RFDS in the northern half of the Northern Territory including medical chests (*see* paragraph 17), clinic services and air evacuation.

Commercial Rescue and Retrieval Organisations

22. In many parts of Australia, professional rescue and retrieval organisations have been established, which have significant assets and expertise which may be appropriately utilised in disaster response. There is a significant number of medically dedicated aircraft nationally, and each can normally take two stretcher patients and up to three sitting patients. Whilst capacity is limited, there is the opportunity to provide rapid air transport of additional medical teams and resources to incidents, and to evacuate patients over long distances.

Bush Nursing Posts

23. A variety of government and non-government agency nursing posts are scattered throughout isolated areas. These are often only staffed with one to four nurses with a modest pharmacy and clinic facility. At some, buildings remain from earlier years when they functioned as hospitals providing in-patient care. In the event of a disaster in a remote area, these facilities may be the closest to the scene and staff can be the first responders. They can, and have been, converted into acceptable staging posts for assessment and holding of casualties until further distribution of patients can be arranged.

Mining and Industrial Sites

24. Most mine sites and large industrial complexes carry well equipped medical centres and are normally well supplied with equipment for rescue and first aid to accident victims. Mine rescue teams exercise regularly in extrication and transport of casualties resulting from rock falls and explosions. They are a useful resource for dealing with other types of disasters and must be incorporated into regional disaster plans.

SHIPS

Merchant Navy

25. Australian merchant vessels contain a basic supply of drugs and dressings as required under the Marine Orders of the Department of Transport. The quantities are dependent on the size of the vessel and the nature and location of operations. Additional antidotes and hazardous agents handling equipment are also often carried.

Royal Australian Navy

26. Royal Australian Navy ships have a comprehensive supply of drugs and dressings depending on the size of vessel. Additional resources available may include a medical officer, medics and a helicopter and crew regularly exercised in extrication and casevac. New helicopter amphibious support ships will be fitted with an advanced casualty reception area including operating theatres, intensive care, x-ray, laboratory and inpatient facilities.

RAILWAYS

27. Railway resources should be considered for transport of large quantities of personnel or supplies to disaster areas and for transport of casualties or the uninjured away from the disaster site. This may be particularly useful when disasters or transport incidents are close to major interstate rail routes.

PRINCIPLE
Available resources can range from one individual to national multi-service assets. Identify your resources.

SUMMARY

28. It is important that volunteer efforts are supervised and coordinated within the total medical disaster plan.

29. Extensive external health resources exist across the nation, and may be sourced through official links.

30. Many suitable resources may be available from relative close proximity, in view of National/State/Regional or cross-border functional responsibilities.

REFERENCES

31. References used in this Chapter are as followes:

- Baskett, Peter J. F. and Weller, Robin M.: **Medicine for Disasters**. ISBN 0 7236 0949 7
- Emergency Management Australia: **Australian Emergency Manual Series: Part V, Manual 9—Communications**, Second edition, 1999

Annex:
A. Australian Defence Force Medical and Health Assets and Royal Flying Doctor Service Bases.

CHAPTER 14

MEDICAL SUPPLIES AND EQUIPMENT

INTRODUCTION

1. Recurring problems in the response phase of disasters arise from a combination of factors, including lack of accurate information from previous disasters, poor understanding of the disaster plan and the unique nature of each disaster.

2. Experience has shown that equipment is required for airway management, control of haemorrhage, management of shock and pain relief. A number of States have recommended disaster kits that participating agencies are required to maintain. Equipment tables for disaster relief have also been produced by the World Health Organization and the National Disaster Relief (Health) Committee.

3. Disaster plans must anticipate the need for supplies. Staging areas should be established in safe locations near the site to ensure proper resource management. Appropriate delivery and timely dispatch of supplies, especially critical items such as Intravenous fluids, dressings and splints, should be under the control of a supervisor in this area. Supplies earmarked for disaster relief should be obtained from in-country suppliers, who can guarantee re-supply within predictable lead times. Lists of suppliers should form part of the disaster plan resource document.

4. At times in multi-casualty incidents, the decision is made to take the direct resources to the patient(s) pending their transport to hospital. It is essential that in the planning phase, consideration be given to the equipment that should be maintained for such eventualities.

PRINCIPLE
Anticipate supply needs in planning. Manage supplies with timely responses.

MEDICAL SUPPLIES AND STORES

5. Disasters generate numerous requests for assistance including pharmaceutical supplies and medical gases and equipment. Often these requests will be uncoordinated, exaggerated or inadequate. Both provider and recipient may hamper the effectiveness and usefulness of this aid. Disaster supplies are rarely used, therefore; their cost and replacement are important considerations. Careful selection and stock rotation can minimise holding costs.

Potential Problems

6. Problems which may occur include:

- lack of realistic assessment of needs;
- unrealistic requests;
- inappropriate equipment;
- non-essential pharmaceuticals;
- diversity of supplies; unmarked or unsorted shipments;
- unintelligible labelling;
- expensive machinery;
- time-expired products (effective stock rotation principles can minimise wastage);
- late arrivals of stores;
- inappropriate storage of drugs (security, heat, weather) both in transit and awaiting distribution; and
- customs clearance restrictions.

Optimal Care

7. Experience has shown that optimal medical care can be delivered with a limited set of drugs. The use of medical supplies varies in relation to:

- the type of medical assistance (ie first aid, acute surgical care, routine treatment of common diseases, preventive medicine, treatment of infectious diseases and the like);
- duration of the operation;
- the number and breakdown of people to be assisted (children, infants, geriatric populations); and
- the type of disaster.

Supply Planning

8. Planning should avoid or minimise deficiencies as follows:

- ***Epidemiological Research***—Research and database development should be undertaken, with relevant improvements reaching decision-makers, disaster planners and relief organisations;
- ***Precise and Objective Compilation of Requests***—Pre-disaster planning by health and relief groups should be done with lists of pharmaceutical and equipment restricted to essential items. Lists should use generic names and special storage or transport requirements should be delineated. Requests should be precise with supporting data on number of injured, types of injuries and the like; and

- ***Standardisation of Medical Supplies***—Basic standardised lists of pharmaceuticals and equipment have been developed by a variety of organisations. Some examples are described below.

PHARMACEUTICAL AND EQUIPMENT LISTS

Australian Medical Disaster Coordination Group Pharmaceutical and Medical Equipment List for Disasters

9. This list has been developed by the Commonwealth Department of Health and Aged Care (DHAC) and the Defence Health Services Branch, Australian Defence Force, Department of Defence. The supplies are not pre-packaged but are identified by Defence Stock Number and can be collected and assembled in a matter of hours by Defence or private supply agencies.

10. The contents are designed to provide supplies for direct disaster victims and ongoing supplies for a standard cross section of Australian communities indirectly affected. It provides for 500 casualties for 3 days in a typical affected community of 50 000.

11. The latest list is divided into five parts:

- ***Group A—Pharmaceutical Drug List (for Disasters)***—This comprises solely pharmaceuticals, totalling 64 in number.
- ***Group B—Equipment List***—This includes the basic equipment needed to set up a clinic for examination and treatment facility. It would not be needed if an equipped existing clinic or primary care facility was available.
- ***Group C—General Dressing List (for Disasters)***—This is new to the list, although a Surgical Dressings List has existed for nearly twenty years, as a separate resource reference.
- ***Group D—Anaesthetic (General) List***—This is optional and consists of pharmaceuticals to be used if anaesthesia and surgery are to be conducted.
- ***Group E—Anaesthetic Apparatus and Equipment List***—This is the list of support equipment and apparatus to be used in conjunction with Group D.

12. All drugs are listed alphabetically with form, strength and quantity identified. Special handling and storage requirements are noted. The preparation and packaging of the list is exercised regularly in conjunction with Emergency Management Australia (EMA) and Department of Defence (DOD) and this provides for a cyclic review process.

World Health Organization (WHO)—Emergency Health Kit

13. This kit was developed by WHO, United Nations, London School of Tropical Medicine and the International Federation of Red Cross. It has been adopted by national authorities, donor governments and relief organisations as a reliable, standardised, inexpensive, appropriate and quickly available source of the required pharmaceuticals and essential laboratory equipment in any disaster situation.

Red Cross Emergency Set

14. The International Federation of Red Cross and Red Crescent Societies espouses the WHO kit as its main response to health needs following natural disasters. The International Committee of the Red Cross (ICRC) deals primarily with conflict disasters and wars and has devised standard sets to respond to those particular medical and surgical needs.

PRINCIPLE **Optimal care can be delivered with a limited set of drugs: Use standardised lists.**

MEDICAL EQUIPMENT

15. Medical equipment must be packaged in such a way that medical personnel can carry it. Disaster kits, packs, trunks etc, must be light enough that they are manageable. The kits should be robust with strong handles. Medical personnel may be involved in lifting the equipment in and out of vehicles and aircraft, over rough terrain, or over great distances.

16. Commonly used methods for carrying disaster supplies include:

- Thomas Pack;
- Hagar Trunks;
- Fishing Tackle Boxes;
- Disaster Jackets;
- Perth Bags; and
- Laerdal Disaster Kits.

17. The salient features of any equipment collection are:

- familiarisation;
- maintenance; and
- suitability.

Familiarisation

18. It is important that personnel know the equipment that they will be using at a disaster site, and how to use it. Equipment used in training should be the same as that used at the disaster.

19. Emergency equipment and supplies may be stored or pre-positioned. These sites and personnel who are supposed to use the equipment should be clearly designated.

Maintenance

20. Equipment should be regularly checked and maintained. This requirement also applies to larger regional stockpiles of equipment and stores. When equipment lists are changed, it is essential that all potential users be notified that amendments have been made, and that out of date lists are withdrawn.

Suitability

21. Pharmaceutical supplies can be stockpiled to avoid shortcomings in responses. Individual care can be administered with a limited set of standard drugs, and health professionals must learn to utilise fewer materials than they would ordinarily use.

22. Minor equipment and supplies should be interchangeable and can be used at casualty clearing posts, during transport and in reception areas. Pre-packaged kits are inexpensive and can help save lives.

23. Sophisticated electronic monitoring equipment is usually unnecessary in the field. The majority of casualties will be suffering from traumatic injuries rather than acute medical problems and as such clinical assessment of vital signs is the most important method of monitoring. Pulse oximetry provides useful benefit especially in monitoring transported patients.

24. A simple ‘low-tech’ approach to providing medical equipment for field use is most appropriate. Diagnostic aids are often limited by noise, lighting and other environmental factors so that powers of clinical observation become even more important.

25. Equipment, especially that used in the field, needs to be simple, durable, ‘rugged’, and easy to clean and disinfect. It also requires suitable packaging or containers, which are lightweight, durable and well labelled.

MEDICAL EQUIPMENT SETS

General Medical

26. General medical kits should be prepared which cover the anticipated medical needs for dealing with casualties. Various methods of organising these are acceptable, provided the kits cover basic needs of airway management and respiratory support, haemorrhage control and circulatory support as well as management of fractures and burns.

27. Emergency drugs are usually limited to those necessary for trauma management (analgesics and anaesthetics) plus some general emergency drugs. More extensive supplies of drugs to deal with routine health problems over a prolonged period are normally not necessary for short duration incidents. Examples of medical kits, which might be prepared, are outlined below.

Airway and Respiratory Support

28. These enable effective emergency management of acute respiratory failure, for example, obstructed airway, tension pneumothorax or flail chest. An example listing is at Annex A.

Haemorrhage and Circulatory Support

29. The control of haemorrhage necessitates a sufficient supply of individual sterile dressings and calico or elastic bandages. Circulatory support requires administration of intravenous fluids for sustaining blood volume, until the patient reaches a receiving hospital, or until blood transfusion is available. An example listing is at Annex B to this Chapter.

General and Miscellaneous

30. A collection of basic diagnostic and therapeutic items necessary for staff in the field to complement other kits. An example listing is at Annex C.

Emergency Drugs

31. An example listing of basic emergency drugs is at Annex D to this Chapter.

Other Kits

32. These can vary according to specific threats, individual regions and particular hospital practice. Some examples include:

- amputation kits;
- personal comfort packs;
- non-disaster major event kits;
- fracture immobilisation kits; and
- diagnostic kits.

33. As the equipment will be used infrequently, it is essential that personnel are familiar with its uses. All instrument sets, disaster kits and special purpose kits should be suitable for practical use in the field.

Major Equipment and Supplies

34. Major equipment includes pulse oximeters, cardiac monitor-defibrillators, portable ventilators, combined monitors and intravenous infusion pumps. They have a limited role in management of the critically injured in disasters, and only when there are sufficient resources to deal with all salvageable victims. These items are available in most hospitals, but appropriate portable versions are available for field use, and personnel must be skilled in their use.

Other Equipment

35. Oxygen supplies and suction equipment are essential. Ambulances must be equipped with two oxygen supplies, one portable and the other built-in.

36. In large urban areas back-up stores should be readily available, be labelled, transportable and should include:

- stretchers;
- large burn dressings;
- back or spinal boards;
- splints;
- blankets;
- triage tags;
- plastic containers of clean water;
- haemostatic dressings; and
- portable oxygen distribution systems and suction units.

PRINCIPLE
Use suitable simple equipment and supplies, maintain them and be familiar with them.

BLOOD (SUPPLY AND TRANSPORT)

37. Blood and blood products may be requested in disaster situations. The Australian Red Cross has a National Headquarters and Regional Blood Transfusion Services (BTS).

38. All disaster plans, (especially hospitals) should include the Regional BTS in their planning. Crystalloids and/or plasma expanders can be utilised in field situations. If blood or blood products are required, special storage/transport requirements exist and should be catered for in planning.

IMPROVISATION

39. Medical equipment in disasters may be lost, unavailable, damaged or simply insufficient in quantity. Field expedient techniques and improvisation will need to be maximised. These can include improvised splinting, immobilisation, intravenous fluid stands and evacuation assets.

SUMMARY

40. Staff members responsible for the formulation of disaster response plans, should prepare such in consultation with the end users. Advice on realistic medical supply needs should be sought, and training in the contents of the

disaster plan and subsequent medical supply kits should be provided to all relevant medical personnel.

41. Preparation of medical supply and equipment kits should be realistic to the likely needs of the casualties and medical personnel. The inclusion of items that are unlikely to be used, or that can not be rotated through normal day to day stock should be avoided where possible.

42. Packaging of all supplies and medical equipment should be arranged in such a way that it can actually be deployed, transported and eventually carried, by those for whom its use is intended.

43. Improvisation and lateral thinking are valuable tools to ensuring the formulation of useable and practical medical and equipment supply kits. Regular and timely maintenance and stock rotation of all assets is vital to ensure their ongoing viability.

REFERENCES

44. References used in this Chapter are as follows:

- Auf Der Heide, Erik.: **Disaster Response: Principles of Preparation and Coordination**. St Louis: CV Mosby, 1989, ISBN 0 8016 0385 4
- Baskett, Peter J. F. and Weller, Robin M.: **Medicine for Disasters**. ISBN 0 7236 0949 7
- Spirgi, Edwin H.: **Disaster Management: Comprehensive Guidelines for Disaster Relief**. ISBN 3 456 80687 6
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Annexes:
A. Airway and Respiratory Support
B. Haemorrhage Control and Circulatory Support
C. General and Miscellaneous
D. Drug Box

AIRWAY AND RESPIRATORY SUPPORT

Oral (Guedel) Airways:

Size 0
Size 1
Size 2
Size 3
Size 4

Nasopharyngeal Airways:
Size 6mm
Size 7mm
Size 7.5mm

Endotracheal tubes, cuffed:
Adult size 7mm
Adult size 8mm
Adult size 9mm
(All pre-cut with Portex connectors and introducers)
Adult size 8mm uncut

Endotracheal, uncuffed:
Paediatric size 3mm
Paediatric size 4mm
Paediatric size 5mm
Paediatric size 6mm
(All pre-cut with connectors and introducers)

Extension tubing with swivel connection 15mm x 22mm

Laryngoscope with spare batteries and bulbs
Adult Blade
Child Blade

Magill's Forceps
Adult size
Child size

Syringe 10ml
Spencer Wells Forceps

Lignocaine jelly sachets
Adhesive tape 2.5cm
Linen tape

Self-inflating bag valve mask assembly:

Adult bag & reservoir
Mask size 4
Mask size 5
Child's bag & reservoir
Mask size 1
Mask size 2
Mask size 3

Portable mini-suction unit with:

- Suction tubing
- Yankuer sucker
- Y-suction catheters
- Size 10
- Size 14

Pneumothorax kit - pre-packed
(including intercostal drain tubes, Heimlich valves or drainage bags, connecting tubing, scalpel, forceps, suture material)

Cricothyroidotomy kit - pre-packed
(including scalpel, introducer, and tube with Portex connector, securing tape)

Disposable gloves:

- Small
- Medium
- Large

The above list is only a guide. Requirements should be decided locally on the basis of hazard analysis and proper disaster planning.

HAEMORRHAGE CONTROL AND CIRCULATORY SUPPORT

Dressings:

Field dressings, standard compressed BPC No 13
Shell dressings, standard BPC No 15
Combine, sterile pack 20cm x 20cm
Multi-trauma dressings 75 cm x 25cm

Cloth triangular bandages
Crepe bandages 5 cm & 7.5 cm

Eyepads
Adhesive tape 2.5 cm
Adhesive tape (non-allergenic) 2.5 cm

Cannulae:

Intravenous giving sets - with hand pump
Intravenous cannulae:

Adult
Size 14G
Size 16G
Size 18G
Paediatric
Size 20G
Size 22G

Other:

Alcohol wipes
Tourniquets
Adhesive dressing tape 7.5 cm
Disposable gloves (small, medium and large)

Intravenous fluids:

Hartmann's solution 1000 mls (soft bags)
Haemaccel solution 500 mls

The above list is only a guide. Requirements should be decided locally on the basis of hazard analysis and proper disaster planning.

GENERAL AND MISCELLANEOUS EQUIPMENT

Stethoscope
Sphygmomanometer (Non-mercury type)
Scissors, heavy duty

Tourniquets

Pencils, indelible - waterproof
Ballpoint pen
Marking pen, felt tipped
Triage tags (each colour)

Torch - Penlight
Light stick, Cyalume Protector

Whistle
Space blanket, disposable
Safety pins (large)
Length of white linen tape/cord
Eyepads
Adhesive tape 2.5 cm
Adhesive tape (non-allergenic) 2.5 cm

Disposable gloves:
small, medium and large
Protective gloves (lattice or 'turkey' gloves)

Syringes:

- 2 ml
- 5 ml
- 10 ml
- 20 ml

Needles:

- 19G
- 23G

A wide range of pharmaceutical drugs will be required where continuing health care is to be provided to disaster affected persons for more than a few hours.

The above list is only a guide. Requirements should be decided locally on the basis of hazard analysis and proper disaster planning.

DRUG BOX

BASIC EMERGENCY CARE AND SUPPLEMENTARY RESUSCITATION

Cardiac:
Adrenaline
Atropine
Frusemide
Glyceryl trinitrate sublingual
Lignocaine

Analgesia and Local Anaesthesia:
Bupivocaine
Lignocaine
Morphine
Pethidine

Sedation:
Halperidol
Ketamine
Midazolam or Diazepam

Miscellaneous:

Dextrose 50%
Naloxone
Salbutamol aerosol
Sodium chloride ampoules

Antibiotics:
Cephalosporins
Chloramphenicol ophthalmic ointment
Flucloxacillin
Penicillins

Anaesthetic Relaxant:
Atrocurium
Pancuronium or Vecuronium
Succinyl choline

Other:
Adult Diphtheria and Tetanus vaccine
Aspirin soluble tabs
Combined Diphtheria and Tetanus vaccine
Dexamethasone
Mannitol 20%
Metoclopramide or Paracetamol tabs
Phenytoin sodium
Prochlorperazine
Salbutamol ampoules
Tetanus vaccine
Water for injection

NOTE:
The range of drugs required in the field at a disaster site for basic care is very limited: analgesics, local anaesthetics and limited emergency resuscitation drugs. A wider range of pharmaceutical drugs will be required where:

- more advanced care is to be given in the field: elective intubation and ventilation or surgical procedures are to be performed; or

- continuing health care is to be provided to patients for more than a few hours.

The above list is only a guide. Requirements should be decided locally on the basis of hazard analysis and proper disaster planning.

CHAPTER 15

PERSONAL EQUIPMENT AND IDENTIFICATION

INTRODUCTION

1. This chapter gives guidance on the selection of personal equipment that should be provided for each team member and the team collectively.

PERSONAL EQUIPMENT

Helmet

2. A safety helmet must be provided and worn on all appropriate occasions. Factors in their selection include the following:

- ***Material***—Plastic or fibreglass.
- ***Sizes***—Are they fixed sized or adjustable?
- ***Colour coding***—Do they conform to the international (green for medical) standard?
- ***Chin Straps***—Are helmets supplied with chin straps, or do they have to be purchased separately?
- ***Visors/Goggles***—Can helmets be fitted with visors or goggles?
- ***Light***—Is there a facility for fixing a miner's style light on the helmet?
- ***Designation of Wearer***—Helmets should be labelled with doctor or nurse etc. Any marking of the helmet must be done in a manner not to affect the integrity of the helmet. Helmets should not be swapped for health reasons.
- ***Storage***—Helmets may have special storage requirements eg plastic helmets should not be exposed to continuous sunlight .
- ***Replacement***—Approved helmets have an expiry date. A cyclic replacement program is recommended.

Eye Protection

3. Eye protection may be required from dust debris, and body fluids.

4. Choices are goggles, glasses or visors. Perspiration, condensation and comfort are factors to be considered.

Respiratory Protection

5. This may be required for noxious smells, dust, body fluids or toxic atmospheres. Choices are cloth masks, disposable filter mask or cartridge mask. Education of the limitations of each type must be carried out.

Overalls

6. There are a number of points to be considered in the choice of a protective overall:

- ***Material***—This should be low flammability, wool or cotton. Should be appropriate for the climate, hot or cold, wet or dry.
- ***Design***—Zips versus studs. Is there an inside security pocket, velcro or elastic on wrist or feet? Reinforced knees/elbows? Male and female sizes? Many response agencies are moving toward a two piece suite. This allows for flexibility of sizing and replacement.
- ***Colour and Markings***—Do they conform to international standards? Is the identification of the wearer clearly identified?
- ***Additions***—A belt should be provided that can carry a water bottle and portable phone/radio.

7. Disposable overalls are now manufactured. These provide additional protection against hazardous chemicals and should be considered in addition to the above.

Footwear

8. Points to be considered are:

- protection;
- high rubber soles—grips;
- ankle support;
- leather/suede uppers;
- mid-calf in length; and
- sewn in tongues.

9. The best type of footwear available would appear to be military/fire fighters style of boot.

10. Disposable overshoes are now manufactured. These provide additional protection against hazardous chemicals and should be considered in addition to the above.

Gloves

11. Gloves are required for protection from sharps, debris, body parts and fluids. Different gloves may have to be provided for different circumstances that occur during treatment, rescue and extrication of casualties and their subsequent treatment.

Environmental Factors

12. Environmental factors, in both natural and human-caused scenarios, may require specific-to-task additional or alternative clothing. For example, in natural disasters, clothing will need to meet the climatic conditions in the disaster area, eg lightweight for hot and humid and heavy but manageable for extreme cold or high altitude. Clothing should not only be weather proof but waterproof. In the case of human-caused disasters, eg chemical, biological or nuclear incidents, clothing specifically designed to provide adequate protection to the wearer would be a pre-requisite.

Comfort Kit

13. A number of items should be maintained or easily sourced for the comfort and hygiene of the medical team. These may include the following:

Bobby pins
Comb
Container for drinking water
Deodorant
Disposable white ‘Chux’
Elastic bands
Environmental wipes
Eye drops
Glucose sweets
Hand cream
Insect repellent
Lip balm
Nail File
Shaving kit
Simple analgesia
Soap washers
Sun protection cream
Talcum powder
Tampons
Tissues
Toilet paper
Toothpaste and toothbrush

PERSONAL IDENTIFICATION

14. Recognised identification should be carried by all responders to permit access to the site. In circumstances such as a controlled response to a disaster overseas, or in the secure area, the possession of a prepared form of personal identity card would be advantageous. Such a card should include a photograph, name of organisation, name and designation.

REMOTE AREA AND OVERSEAS RESPONSES

15. Annex A provides information on personal and team equipment recommended for such responses.

SUMMARY

16. All personnel require appropriate environmental friendly protective clothing.

17. It is imperative that there is a visible means of clearly identifying the discipline and the role that they are fulfilling.

18. Personnel who are likely to be called as part of a disaster response must have predetermined the right size of protective equipment. The time to determine if the attire fits is not when the disaster occurs.

Annex:
A. Recommended Personnel Equipment for Disaster Medical Assistance Team Members

RECOMMENDED PERSONNEL EQUIPMENT FOR DISASTER MEDICAL ASSISTANCE TEAM MEMBERS

BACKGROUND

1. This document contains suggested supplies required to support a six-person medical team, deployed in outback Australia or overseas, as part of a counter-disaster response. Specific medical equipment is not documented as relevant lists exist elsewhere. It is assumed that the team could be deployed for a period of up to 14 days. It is not anticipated that the medical team will be required to provide the contents of the list, However it is the responsibility of the State Controller to source and transport the items required.

GENERAL

2. It is important that a field team does not become another administrative and logistic problem for the host area in the immediate post-disaster phase. Apart from fuel for the generator and a watersupply, the team should be able to operate without any support for 3–4 days.

EQUIPMENT

3. Suggested equipment:

- **Clothing** (uniform):
  - Helmet, safety, green in colour. Marked with designation ‘Doctor’, ‘Nurse’, front and rear.
  - Hat, khaki fur felt brim type (as issued to Australian Army).
  - Jacket, waterproof, zip-up with hood, green x 1.
  - Overalls, green, helicopter pattern. Should be fully zipped for best protection against insects x 3.
- **Markings**
  - National flag on right chest, Hospital badge on left chest. (for overseas deployment)
  - Gloves, cotton reinforced or similar x 2 pairs.
  - Boots, leather with canvas uppers, Vietnam pattern x 1 pair.
  - Belt, webbing x 1.
- **Personal Clothing**
  - 2 changes civilian clothing.
  - 6 changes of underclothing and socks. 6 tee-shirts or singlets.
- **Accommodation Stores**
  - Tents 11’ x 11’ or similar x 2.

Note: *Two large tents allow flexibility in use viz. sleeping and stores areas, male and female work and rest areas.* Tarpaulin 15' x 15' (or similar) x 1.

- Camp beds x 6.
- Mosquito nets x 6.
- Sleeping bags x 6.
- Mess sets x 6. Knife, fork, spoon sets x 6. Cups x 6.
- Plastic buckets x 2.
- Small generating set to operate battery charger and fluorescent lights.
- Container, metal, jerrican type x 2.
- Pressure cooker (to use as steriliser) x 1.
- Flag, national x 2 (1 large for base; 1 small suitable for vehicle).
- Flag, Red Cross (as above) x 2.
- Lights, fluorescent and leads x 3.
- Saw, general purpose x 1.
- Rescue kit, S.O.S. or equivalent type x 1.

• **Communications**

- Radio AM/FM, commercial with rechargeable batteries x 1.
- Scanner, programmable, with rechargeable batteries x 1.
- Transceivers UHF/ VHF with rechargeable batteries x 2.
- Battery charger x 1.
- Torches (rechargeable batteries) x 6.

• **Food**

- Ration packs, 24 hour (3 per team member) x 18.
- Water bottles, individual with carriers x 12.

• **Personal Hygiene**

- Toilet kits x 6.
- Shaving kits x 6.
- Sanitary napkins x 3pkts.
- Soap x 6. Towels x 6.
- Detergent x 2.
- Toilet paper x 3.
- Tissues, facial (Box of 200) x 3.

- **Medical**
  - Should overseas deployment be the South Pacific/South East Asia areas, appropriate precautions are essential. (Refer Commonwealth Health/Defence Health Service Branch for current recommendations.)
  - It is mandatory that the following supplies be taken:
  - Insect repellent.
  - Anti-malaria tablets.
  - Water purification tablets.
  - Sunscreen sufficient for 6 people x 14 days.

NOTE

The above list is only a guide. Requirements should be decided locally on the basis of hazard analysis and proper disaster planning.

CHAPTER 16

MASS GATHERINGS

INTRODUCTION

1. The following chapter has been extracted from the **Australian Emergency Manual—Safe and Healthy Mass Gatherings: A Health, Medical and Safety Planning Guide for Public Events.** The Manual focuses on a number of major areas which, either singularly or collectively, have historically contributed to problems at mass gathering events. These have included site selection, venues, structures, public access, spectator and crowd management, emergency service access/egress, public safety, security, public health and medical care. Health personnel should refer to the Manual for further detailed information on managing the health aspects of public events.

2. It is emphasised that health workers need to become intimately involved in the planning process for events, and to regularly liaise with the police, security and other stakeholders.

THE NEED TO PLAN

3. Throughout Australia on any given day events are conducted which attract crowds large and small, at varying types and styles of venue. The quality and quantity of planning and preparation for health and safety aspects of these events vary considerably. This may be due to many factors such as the number of spectators, the nature of the event, and the promoter's experience. Inadequate planning can increase risks associated with insufficient or ineffective spectator management or service provision. The evidence lies in the large number of public events where multiple injuries, illness and deaths have occurred.

4. Furthermore, in planning events, organisers may fail to consider 'what if a major emergency situation should occur during the event?' All of these risks pose a threat to the successful staging of events, and therefore need to be managed with appropriate planning and preparation.

5. Planning for public events requires cooperation between event organisers and relevant government, private and community organisations. During the planning process many issues will need to be considered and explored by organisers and authorities before an event proceeds.

6. Event organisers/promoters should be encouraged to form a 'management committee' including members of the emergency services, local authorities and health services. Sub-committees may be required to provide planning for particular aspects of the event. Health professionals should be involved in planning for all phases of the event, including pre-event preparation, conduct of the event and demounting of the facilities. The following are some of the key issues that should be addressed from a health and safety perspective.

APPROVAL FOR THE EVENT

7. Event organisers usually must gain approval from local, and sometimes State authorities to hold public events. Information on the approval process should be obtained, including:

- details of the approving authority and any other authorities actively involved in the approval process;
- information required to support their application; and
- timetable including relevant deadlines for lodging of applications. (Lead time will be required for applications to be processed).

8. As a condition of approval being granted, after the event, organisers may be required to provide feedback on the approval process and an evaluation of the event. This may be done in the form of a debrief or a report to relevant authorities.

LEGAL ISSUES

9. There is usually some form of legislation which governs or restricts public events or aspects thereof. In some cases, particularly for extremely large or high impact events, special State or local legislation for the event may required.

10. Organisers should consider obtaining legal advice prior to the event. Items which warrant consideration include:

- liability for injuries;
- liability for acts or omissions;
- liability for financial obligations incurred in responding to major emergencies occasioned by the event; and
- possible liability for the resultant effects of the event on normal emergency operations.

11. Permits will be required for parades, sale and consumption of alcohol, and fire safety. Permission may also be required should it be necessary to close certain adjacent or peripheral roads or streets.

12. Most public sector agencies have adopted a ‘User Pays’ policy for services provided at sporting and entertainment events. The aim of this policy is to improve the allocation of statute resources in the general community, by providing a system of charging for services deployed to plan for, and respond to, sporting and entertainment events. Event organisers should consult local and state authorities for relevant fee structures and to determine any charges for services provided.

13. Organisers may be required to post a bond or provide liability insurance cover to meet costs of response to emergencies, subsequent venue clean-up, traffic, crowd, and other policing functions.

VENUE

General

14. It may be necessary to consider a number of alternative venues for the event. Emergency managers may be able to recommend appropriate venues based on health and safety considerations.

15. The following should be considered in selecting a suitable venue:

- Will multiple venues be required to stage the event?
- Is the event normally conducted at a fixed facility?
- Is it planned to use a fixed facility in other than its normal use?
- Is the event regularly conducted at a temporary venue?
- Is the event a 'one off' at a temporary venue?
- What services/utilities are available at the venue?
- What additional services and utilities will be required at the venue?
- Is there a need for backup services?
- What shelter facilities are available at the following areas?
  - Transport pick up and set down areas.
  - Spectator and official viewing areas.
  - Seated eating areas.
  - Pedestrian thoroughfares.
  - First aid and medical centres.
  - Competitor and officials marshalling areas.
- What will be the duration of the event and will it go into the hours of darkness?
- Have the needs of people with disabilities been provided for?
- Does the date of the event clash with other events to be conducted in the area?
- Will the weather require any special considerations?

Hazards

16. In selecting a site, especially for an outdoor event, an analysis should be made of any potential hazards in the area. Hazards may include:

- powerlines which could be brought down by a severe storm;
- waterways that may be prone to flooding;
- bushfires;
- high winds;
- extremes of temperature; and
- pests, large animals, pollens and poisonous plants.

Access and Egress of Health and Emergency Services

17. The needs of health and emergency services for access to, and egress from, the venue, as well as movement around and within the site, must be taken into account in planning for the event. Official parking should also be made available for attending health and emergency services personnel.

18. Planning should ensure that emergency services personnel have access to all sub-sections of the venue, including performance, spectator and parking areas.

19. Transport management is essentially the domain of police, venue security, and transport and local government authorities. Planning should ensure that the venue has adequate access and egress for emergency service vehicles. Dedicated perimeter roads may be required for emergency services. In order to provide access and a buffer zone, adjacent streets on all sides of a venue may need to be closed, and parking banned, with access restricted to emergency, service and residents' vehicles. Emergency services need to be informed of any traffic alterations from the norm, such as the blocking off of public streets. Roadways and access routes should be clearly distinguished, signposted and kept clear.

20. The venue needs to have an adequate access and marshalling area for emergency vehicles. Issues include the following:

- Is there adequate access to and within the venue? Is there a road network, or would responders have to walk significant distances to the spectator or performer areas?
- Is the venue served by a road which could be closed to the public and used only for access and egress of emergency service vehicles?
- If access roads are unpaved, would emergency or service vehicles become bogged if heavy rains occurred during, or just prior to, the event?
- Once on-site, is there sufficient room for marshalling, manoeuvring, repositioning or redeployment of emergency vehicles?

- Would departing vehicles be prevented from leaving by congestion produced by other vehicles arriving?
- Are adequate access and marshalling areas available for large numbers of emergency vehicles should a major incident occur?
- Is there a suitable site available for aeromedical evacuation?
- In the event of a mass casualty situation, does the venue layout provide, space for an on-site triage area to permit treatment prior to removal of patients? To eliminate the need to carry casualties and equipment over long distances, is such an area easily accessible?

Crowd Movement

21. Aspects of managing crowd movement where there may be health and safety implications are as follows:

- Public transport—congestion at road, rail, and water interchanges and, in some cases, at airports.
- Use of coaches and buses to reduce private vehicle usage and any potential problems which large vehicles may present, for example access difficulties, parking requirements, potential road blockages.
- Alterations to normal traffic arrangements and different patterns of road usage.
- Traffic control.
- The surrounding road network should be able to handle the anticipated spectator vehicular traffic, before, during and after the event.
- Public parking arrangements, overflow parking arrangements, signposting, segregation of pedestrian and vehicular traffic. If spectator parking areas overflow, will it cause congestion on surrounding roads? Are shuttle buses desirable, feasible, or necessary?
- Parking control.
- Communication between traffic management groups and other services.
- Access and egress routes including:
  - arrangements for people with disabilities;
  - pedestrian access including consideration of distance, terrain, surface and lighting; and
  - designated pick up/set down points.
- Signposting, including gate numbering, inside and outside of the venue.
- Communications inside and outside the venue to provide public announcements, marshalling instructions and evacuation orders.

- Systems to monitor crowd flow, for example the use of spotters.
- Emergency services access.
- Outdoor events, sometimes spread over large areas, require some further considerations such as:
  - toilet facilities outside gates and between disembarkation points and the venue;
  - shelter; and
  - telephone facilities.

22. The venue should allow adequate regulation of crowd movement, for example: existing ticketed seating areas, sectoring and flow barriers including separation of vehicles from pedestrians.

23. Spectator overflow areas should be available to prevent crushing. Contingency plans are required in case spectator turnout significantly exceeds expectations. This phenomenon is common at rock concerts.

SPECTATORS

24. Different kinds of events may attract certain types of spectators which require special considerations. For Instance:

- rock concerts may have a higher incidence of problems with drug and alcohol abuse, under-age drinking and possession of weapons;
- religious/'faith healing' events may attract a significant number of ill and infirm people, which may increase the need for on-site medical care;
- events for senior citizens may also require higher levels of health services;
- certain sports events may attract over-reactive and violent supporters; and
- cultural events may require special arrangements, including the provision of interpreter services, special food services and multilingual signposting, brochures and announcements.

25. Where possible, spectators should be informed prior to the event, through advertisements or in leaflets accompanying tickets, of any special conditions or arrangements for the event such as public transport, traffic and parking, clothing, food and drink, sunscreen, shelter and alcohol restrictions.

PUBLIC HEALTH

26. Relevant health authorities must be consulted on:

- safe and adequate water supply;
- food safety;
- sanitation requirements and waste management;

- water and swimming pool safety;
- pest/vector control;
- infectious diseases prevention and investigation;
- standards for activities involving skin penetration, such as tattooing and body piercing;
- building safety;
- noise and other nuisance issues; and
- public health emergency management/planning.

27. Environmental Health Officers should be available on-site during the event to deal with any public health issue and to monitor public health aspects of the event.

28. Health authorities need to have legal authority to enforce 'cease operation' orders upon any on-site food providers who are found to be in contravention of food safety standards or otherwise operating contrary to the public interest.

MEDICAL CARE

General

29. General medical issues to be considered include the following:

- What level of on-site medical care, if any, is expected to be required given the nature of the event?
- What mix of medical personnel will be required on-site, for example, first aiders, paramedics, nurses, doctors?
- Who will provide the personnel? How will they be funded?
- Are they the health service providers for the local area? If not, how will their services be integrated with the local services?
- Are the selected personnel appropriately skilled for the event? Additional training may be required.
- Will there be a need for any special credentialling to allow medical personnel and/or vehicles access to all parts of the venue, especially to any restricted areas?
- How will medical supplies be obtained and resupplied? Who will do this?
- How will drugs be stored securely on-site?

Facilities

30. Suitable medical facilities, such as a first aid room, tent, or vehicle, should be on-site. It should be clearly identified and easily accessible.

Ambulances

31. The relevant ambulance service must be consulted to determine ambulance requirements for the event. Two considerations are as follows:

- Will ambulances be pre-positioned on-site, or will they have to be called to the venue on an as-required basis?
- If ambulances are on-site for participants, (for example at sporting events) are these ambulances exclusively for participants, or will they be available for injured spectators?

Logistics

32. There are many medical logistic issues to be considered in the planning of an event including the following:

- Will medical staff operate in a facility to which the injured must make their way, or will clearly identified medical teams patrol spectator areas?
- Will there be vehicles to transport spectators to the medical facility?
- Will medical vehicles be appropriate to the terrain? For example, 4-wheel-drive vehicles may be required for off-road areas, and golf carts or similar vehicles for high-density spectator areas.
- Where an ambulance is not required, will a ‘chauffeur system’ be provided to transport persons from the medical facility to their own transport?
- How will medical staff be notified of or summoned to spectators requiring assistance in widespread spectator areas?
- What means of communication will be available for attending medical personnel to communicate with off-site medical staff, event organisers, security and other support staff?
- Are there any sponsorship conflicts between the event sponsor and any medical service sponsors?

EMERGENCY RESPONSE PLANS

33. The development of emergency response plans requires a comprehensive hazard and vulnerability analysis, and consultation between all parties that may be required to respond should an emergency situation develop during the event.

34. Some important matters to address include the following:

- Are there additional security personnel, including police, on stand-by or available for call-up should the event require immediate increase in these services?
- Have ambulance services and local hospitals been advised of the nature of the event, expected spectator profile, and possible medical problems?
- Have fire and rescue services been notified as to the nature of the event, and what services might be required?
- Have the necessary types of heavy equipment that could be required in a catastrophe (for example, grandstand collapse) been identified? Have plans been made to obtain that equipment at any time, including out of business hours?
- Have counselling services been advised of the nature of the event, and what services might be required?
- If the event is particularly dangerous, and deaths are a real possibility (for example, automobile or power boat races, airshows), has a framework been laid for any required coronial investigation?
- In order that the exact location of an emergency can be identified quickly, check as follows:
  - Will a grid-type venue plan, common to all services, including access roads, pathways, major landmarks, spectator, performer and vendor areas, be available?
  - Will vendor locations or booths be numbered and be included on the venue plan?
- Where helicopter flights are contemplated for spectators or media to view the event from the air, check as follows:
  - Will flights be prohibited directly over the event and spectators, or confined to circular paths around the perimeter?
  - Will staging areas or helipads be confined to areas away from spectators?
  - Does the proposed staging area or helipad comply with Air Service Australia requirements governing such usage?
  - Will the helicopters be available for medical evacuation should a major incident occur?

Event Cancellation or Postponement

35. From time to time, events may need to be cancelled, postponed or interrupted. This action has the potential to create dangerous situations, especially when a crowd has already gathered. Plans should be in place to appropriately manage such a situation and should address the possible readmission of patrons to the venue.

SPECIAL EVENTS

36. Some events, for example motor racing, may have specific health and safety requirements stipulated by international governing body regulations which must be addressed. These can include the qualifications of personnel, the numbers required to officiate at the event, or physical safety measures. It is therefore necessary for discussions to take place as early as possible in the planning phase to ensure the requirements can be met.

37. Events occurring in remote areas, such as the Outback Opera, demand additional planning as the resources normally available in those areas are well below those that will be required for the event. Special considerations include temporary accommodation for personnel, different clothing requirements, special communication facilities (for example, satellite), support resources (for example, Royal Flying Doctor Service aircraft and rescue helicopters if casualties require special evacuation) and additional costs likely to be incurred due to the remote location.

38. Events involving animals, or at which animals are permitted, have their own special requirements. There have been numerous incidents where a frightened animal has broken loose and created havoc and injuries. Whilst owners and handlers say they are able to keep their animals under control, arrangements should be in place to respond to any loss of control.

39. Multi-cultural events may also have special requirements, especially in respect to communication. To overcome communication difficulties, internationally recognised symbols rather than numerous language signs should be used, and interpreters for service providers, spectators and emergency personnel, should be provided.

DEFENCE ASSISTANCE

40. While it is unlikely that the Australian Defence Force (ADF) would be involved in normal event planning and provision of service, it should be understood that, particularly at very large events, ADF assistance could be provided to the civilian services if a major incident/disaster were to occur.

41. Of course, where the Defence Force is the promoter of the event, such as at an airshow, their planning should be in consultation with the civilian services. A great deal of the content has been covered elsewhere in the AEM on Safe and Healthy Mass Gatherings, and will need to be addressed, taking into account that the event is being staged on Commonwealth land.

42. Under Defence Assistance to the Civil Community (DACC) policy, the ADF may provide assistance to the emergency services if a major emergency/disaster were to occur at mass gatherings. Emergency assistance may be provided if immediate action is necessary to save human life, to alleviate suffering, to prevent extensive loss of animal life, or to prevent widespread loss of or damage to property.

43. Although ADF resources are intended for Defence purposes only, on rare occasions ADF assistance may also be available for the planning and conduct of public events. Requests for such non-emergency DACC will be considered if it can be demonstrated that no suitable alternative source of assistance is available and/or worthwhile training or public relations benefits will accrue to Defence as a result of the provision of assistance. Non-emergency ADF assistance may range from the provision of tentage, accommodation stores, kitchen stores, lighting, generators, static displays, through to advanced assistance including RAAF aerial displays. ADF assistance may also extend to provision of health support. Defence may require full cost recovery if such assistance is provided.

44. For further information on ADF assistance, contact the Defence offices in each State or Territory.

SUMMARY

45. This is a precis of an extensive and informative document and use of, or referred to, the full Australian Emergency Guide is encouraged.

46. Health professionals should be involved in the planning for all phases of the event, including pre-event preparation, conduct of the event and demounting of the facilities.

47. Events occurring in remote areas, involving animals or of a multi-cultural nature, require special consideration.

REFERENCES

48. References used in this Chapter are as follows:

- Emergency Management Australia: **Australian Emergency Manuals Series: Part III, Volume 2, Manual 2—Safe and Healthy Mass Gatherings.** First edition, 1999

- James A. Hanna, M. Sc.: **Emergency Preparedness Guidelines for Mass, Crowd-Intensive Events,** Emergency Preparedness Canada, September 1995

CHAPTER 17

CHEMICAL, BIOLOGICAL AND RADIOLOGICAL INCIDENTS

INTRODUCTION

1. Incidents involving chemical, biological and radiological (CBR) substances occur frequently. Fortunately, most of these incidents are minor, and they may be dealt with adequately at the local level. Occasionally they require a coordinated effort, ie a HAZMAT response, however even these usually have only limited effects on the general population. Very rarely does this type of incident have the potential to require a full DISPLAN response. These guidelines are aimed at ensuring that health services are prepared to deal with incidents efficiently and effectively no matter what their level.

2. There are many real-life examples of CBR incidents. In 1984, the accidental airborne discharge, in Bhopal, India, of 25 tonnes of the pesticide reactive intermediate product methyliso cyanate caused over 2,500 deaths, 150,000 injuries and the displacement of 200,000 people. In 1986, 751 people became ill when the Bagwhan cult poisoned restaurant salad bars with salmonella in Oregon, U.S.A. The dispersion of a caesium-137 radiotherapy unit at Goiania in Brazil in 1987 contaminated 249 people, 26 significantly, and caused 4 deaths.

3. In terms of implications for health services, one of the most significant incidents occurred in March 1995, when sarin nerve agent was deliberately released in the Tokyo subway system, resulting in over 5000 casualties, including 12 deaths. Over 300 (>6%) of the casualties were emergency services personnel (police, fire, medical) who responded to the incident. The low number of deaths from this highly toxic substance was due to a number of factors, not the least being that the sarin was of low purity and the method of dissemination was rudimentary.

4. These were situations which generated mass physiological and psychological casualties. The alarming number of response agency casualties in the last of these examples indicated that procedures for such incidents were either not developed or not followed. Similar situations to the above could occur in Australia resulting in the same outcome.

5. The types of agents which can cause this type of mass casualty incident range from highly toxic commercial CBR substances to specific agents designed for use in warfare, the latter often referred to as Weapons of Mass Destruction. All of these agents pose extreme and widespread hazards, are difficult to detect and identify, and require decontamination to prevent secondary casualties. Their release may be accidental, deliberate, terrorist based, or as a result of warfare.

6. This chapter provides a short introduction to the medical management of CBR hazards. It is by no means a comprehensive guide, and a list of references is included should additional information be required. This will be the case with individual agents, as only a small number of these are briefly described herein.

PRINCIPLE
CBR incidents generate mass casualties, including health care responders if appropriate preparations are not taken.

CHEMICAL AGENT TYPES, EFFECTS AND TREATMENT

Background

7. Chemical agents comprise a range of chemical substances which may be used to kill, seriously injure or incapacitate through their physiological effects. Excluded from this definition are riot control agents, herbicides, smoke and flame, although riot control agents will be briefly addressed.

8. Chemical agents in the modem sense were first used during World War I. They were responsible for over a million casualties, and clearly demonstrated the need for protection from these types of agents. A variety of chemical agents was produced, ranging from chlorine to the blister producing sulphur mustard. Chemical agents were not used in World War II, but at the end of the war stockpiles of newer 'nerve' agents were discovered. These were found to be effective in much lower concentrations than the then-known agents, and nerve agents have now been used in conflict and by terrorists, notably during the Iran-Iraq war and in the Tokyo subway incident. With increasing industrialisation, the release of chemical agents has also resulted from industrial accidents and occasionally during terrorist incidents.

Routes of Absorption

9. Chemical agents may enter the body by several routes and the nature and onset of signs and symptoms vary accordingly. Gases, vapours and aerosols, when inhaled, may be absorbed through any part of the respiratory tract, from the mucosa of the nose and mouth to the alveoli of the lungs. They may also be directly absorbed by the eye. Aerosol particles larger than five microns (μ) tend to be retained in the upper respiratory tract while those smaller than 1μ tend to be breathed in and out again, although some of these smaller particles may be retained. Droplets of liquid, some vapours, and, less commonly, solid particles may be absorbed through the surface of the skin and mucous membranes. Wounds or abrasions present areas which are more permeable than intact skin. Chemical agents may also contaminate food and drink and thus be absorbed by the gastrointestinal tract.

Effectiveness

10. The effective use of any chemical agent is dependent on its physical and chemical properties and on environmental conditions. Agents range widely in their physical properties such as vapour pressures and densities, boiling points and solubility in water. They are classified as non-persistent if they disperse rapidly after release (gases, vapours, aerosols, airborne particles and volatile

liquids) or persistent if they remain in the environment (low-volatility liquids). Their chemical properties, such as reactivity and stability, also vary.

11. The effectiveness of an agent is its capacity to produce the maximum number of casualties or amount of disruption with the least amount of agent. Effectiveness depends on criteria such as an agent's suitability for a particular situation, toxicity, irritancy, and the ability of the target population to neutralise or counter an agent's effects once it has been delivered.

12. Meteorological factors such as wind speed, temperature, precipitation and atmospheric stability will influence the duration of effectiveness of chemical agents. For example, rain will increase the destruction of agents through hydrolysis, but if the air temperature is higher than the temperature at ground level (an inversion), agents will be trapped and tend to persist.

13. The dose of a chemical agent is expressed as its concentration in the atmosphere multiplied by the time of exposure ($mg.min/m^3$). Its effect is measured as the LD_{50}—the dose which is lethal to 50% of exposed unprotected personnel—or the ID_{50}—the corresponding incapacitating dose.

PRINCIPLE
Chemical agents are highly toxic and can be rapidly absorbed through the respiratory tract, mucous membranes, skin and gut.

CHEMICAL—NERVE AGENTS

Properties

14. The nerve agents are a group of particularly toxic chemical warfare agents which are related chemically to the organophosphorus insecticides. They are effective in doses ranging from 10–200 $mg.min/m^3$. The principal agents in this group are: GA (Tabun), GB (Sarin), GD (Soman), GF and VX. The 'G' agents tend to be non-persistent whereas the V agents are persistent. Some 'G' agents may be thickened with various substances in order to increase their persistence, and therefore their ability to penetrate intact skin. In the pure state, nerve agents are colourless liquids. In an impure state, nerve agents may be encountered as yellowish to brown liquids. Some have a faint fruity odour.

Actions

15. The effects of the nerve agents are mainly due to their ability to inhibit acetyl cholinesterase throughout the body. Since the normal function of this enzyme is to hydrolyse acetylcholine wherever it is released, such inhibition results in the accumulation of excessive concentrations of acetylcholine at its various sites of action. These sites include the endings of the parasympathetic nerves to the smooth muscles of the iris, ciliary body, bronchial tree, gastrointestinal tract, bladder and blood vessels; to the salivary glands and secretory glands of the gastrointestinal tract and respiratory tract; and to the cardiac muscle and endings of sympathetic nerves to the sweat glands. The accumulation of acetylcholine at these sites results in characteristic muscarinic signs and symptoms.

16. The accumulation of acetylcholine at the endings of motor nerves to voluntary muscles and in some autonomic ganglia results in nicotinic signs and symptoms. The accumulation of excessive acetylcholine in the brain and spinal

cord results in characteristic central nervous system symptoms. The inhibition of acetyl cholinesterase by nerve agents may be irreversible and effects may be prolonged.

Effects

17. Clinical effects vary depending on which sites are affected. Following inhalational exposure, casualties may experience a sequence of symptoms and signs which include eye pain, difficulty focussing, headache, rhinorrhoea, chest tightness, wheeze, watery secretions from the mouth, difficulty concentrating, anxiety, nausea and vomiting, loss of bowel and bladder control, muscle fasciculation and twitching, seizures, respiratory failure and death. The progression of this sequence will depend on the dose, with high exposures causing seizures within one minute. Liquid nerve agent on skin and in wounds is rapidly absorbed and will cause localised sweating and fasciculation, and subsequent systemic effects. Death from exposure to high doses of agent in any form usually results from asphyxia and cardiorespiratory failure.

PRINCIPLE

Nerve agents act by stimulating nerve endings to cause excess secretions, muscle spasms, seizures, respiratory failure and death.

Treatment

18. Pyridostigmine is available to at-risk personnel as a pretreatment for nerve agent poisoning. Pyridostigmine reversibly binds excess acetylcholinesterase and thus prevents nerve agents from inactivating the enzyme, which is subsequently released. The dose of pyridostigmine is 30 mg 8th hourly, which protects 30–40% of available acetylcholinesterase and provides protection against several times the LD_{50} of GD.

19. Post-exposure treatment consists of atropine, oxime and an anticonvulsant. Atropine is an anticholinergic which reverses muscarinic effects such as excess secretions, sweating and bradycardia. It increases the LD_{50} by a factor of two. If given to non-exposed individuals, side effects will include reduced sweating, increasing the risk of heat stress. Oximes such as obidoxime reactivate acetylcholinesterase by splitting the bond between the nerve agent and the enzyme, particularly at nicotinic sites. The bond between acetylcholinesterase and soman (GD) ‘ages’ rapidly, limiting oxime effectiveness. Oximes increase the LD_{50} by 2–3 times. Anticonvulsants such as diazepam reduce seizures and thus central nervous system damage.

20. Mild poisoning cases exhibiting rhinorrhoea, headache, excess salivation, dimness of vision, chest tightness, nausea and localised twitching, are treated with atropine either alone in an intramuscular dose of 2 mg, repeated as necessary, or in combination with an oxime. For moderate poisoning, with the additional signs and symptoms of dyspnoea, weakness and muscle fasciculation, further atropine and oxime (usually combined in an autoinjector) is given. Severe poisoning cases, manifested by confusion, marked dyspnoea, severe miosis, vomiting, involuntary defecation and urination, convulsions, unconsciousness and cardiorespiratory failure, are treated with repeated administration of atropine, oxime and anticonvulsant. This regimen is essential to survival. Oxygen and assisted ventilation may also be required. Adequate atropinisation is demonstrated by decreased ventilatory resistance, reduced sweating and tachycardia. Caution should be exercised with intravenous

atropine in the presence of hypoxia, as cardiac arrhythmias may result. In moderate and severe cases, treatment should continue for 24 hours. Anaesthesia for resuscitative surgery may be complicated by lifesaving treatment.

PRINCIPLE
Treatment of nerve agent poisoning requires rapid administration of atropine, oxime and diazepam.

CHEMICAL—VESICANT (BLISTER) AGENTS

Properties

21. The vesicant agents include sulphur mustard (HD), nitrogen mustard (HN), arsenical vesicants such as Lewisite (L) (this may be used in a mixture with HD), and the halogenated oximes such as phosgene oxime (CX) whose properties and effects are very different from those of the other vesicants. They are colourless or light coloured and have various odours. They pose both liquid and vapour hazards, are highly penetrating and can be non-persistent or persistent.

Actions

22. Vesicants are very toxic alkylating agents which damage DNA in rapidly dividing cells, causing cellular death. The LD_{50} of HD on skin is 7 gm.

Effects

23. Clinical effects are delayed for mustard. They include skin burning and blistering, burning of the eyes, mucous membranes and lungs, vomiting and diarrhoea (particularly after ingestion) and damage to the blood-forming organs after absorption. The eyes are particularly susceptible and lachrymation, photophobia and conjunctivitis occur within hours. Erythema and skin itching present within 2–48 hours, followed by the appearance of small vesicles which develop into large blisters. Moist areas such as the groin and armpit are most affected and healing may take from weeks to months. Respiratory tract burns present after 4–6 hours as rhinorrhoea, sneezing, epistaxis, laryngitis, cough and dyspnoea, followed by pneumonitis then bronchopneumonia in severe cases.

24. Agent absorption, including through wounds, causes systemic effects. Bone marrow damage results in leucocytosis followed by leucopoenia, with severe cases progressing to aplastic anaemia. Vomiting, convulsions and cardiac arrhythmias follow absorption of high doses.

25. Arsenical vesicants and phosgene produce more rapidly progressive, severe and painful lesions. The systemic effects of arsenic include an increase in capillary permeability leading to haemoconcentration, sometimes progressing to shock and death, and liver, biliary and intestinal damage.

PRINCIPLE
Vesicants act by damaging cells to cause burns, bone marrow depression and/or shock and major organ injury.

Treatment

26. There is no specific treatment for vesicants other than Lewisite, for which dimercaprol (British Anti Lewisite—BAL) may be used. Immediate decontamination of all vesicants is essential to minimise injury. To be effective, BAL eye drops and skin ointment must be applied within minutes of exposure. BAL displaces and combines with arsenic to form a water-soluble compound which is then excreted. If systemic poisoning occurs with Lewisite, as indicated by the presence of cough with dyspnoea and frothy sputum, a large vesicle which had not been decontaminated early, or extensive skin contamination, intramuscular BAL should be given.

26. The aim of other therapy is to relieve symptoms, prevent infections and promote healing. Systemic analgesics are necessary for pain relief. Topical antibiotics and mydriatics (homatropine) are required to reduce complications of eye injuries. Skin lesions require careful management ranging from soothing lotions to debridement, and treatment for any resulting infection. Fluid loss is less than for thermal burns. Respiratory tract lesions require symptomatic treatment including steam inhalations and codeine for cough, bronchodilators, intubation with suctioning and ventilation, and management of infection as required. Inhaled steroids should be considered for phosgene oxime injuries. Systemic effects require supportive care, maintenance of metabolic status and management of the effects of bone marrow suppression including treatment of infection and the use of bone marrow stimulators.

PRINCIPLE
Treatment of vesicant agent poisoning is largely symptomatic.

CHEMICAL—LUNG-DAMAGING (CHOKING) AGENTS

Properties

28. Lung-damaging agents include phosgene (CG), diphosgene (DP), chlorine (CL) and chloropicrin (PS). Phosgene is a non-persistent colourless gas with a high vapour density and an odour of new-mown hay. Similar substances encountered in fires (eg PFIB and HCl) may also induce lung damage.

Actions

29. Lung-damaging agents increase the permeability of capillary membranes and cause bronchiolar epithelial damage resulting in pulmonary oedema, partial atelectasis and consequent hypoxia and haemoconcentration. Effects usually reach a maximum 12–24 hours after exposure.

Effects

30. Early symptoms and signs include lachrymation, sneezing, coughing, choking, tightness of the chest, nausea, vomiting and headache. Skin irritation may occur with high doses. Cough, dyspnoea, frothy sputum, and wheeze then worsen. Severe cases may result in shock with respiratory and cardiac failure. Survivors may suffer long term respiratory sequelae.

PRINCIPLE
Lung-damaging agents act by increasing capillary permeability to cause pulmonary oedema.

Treatment

31. Treatment following exposure to lung-damaging agents, including industrial chemicals, involves enforced rest and supportive care including oxygen and airway support, codeine for cough, fluid replacement and possibly steroids. Antibiotics may be required to treat infection.

PRINCIPLE
Treatment of lung-damaging agent poisoning requires supportive care.

CHEMICAL—CYANIDE (BLOOD) AGENTS

Properties

32. Cyanide agents include hydrogen cyanide (AC) and cyanogen chloride (CK). Hydrogen cyanide is colourless, has an odour of bitter almonds, and is highly volatile and non-persistent. Cyanogen chloride is also highly irritating.

Actions

33. Following inhalation, cyanide agents reversibly bind with the cytochrome oxidase system and interfere with oxygen utilisation at the cellular level, affecting the respiratory centre in particular.

Effects

34. In high concentrations, tachypnoea commences within seconds followed by convulsions, respiratory failure and death. Lower concentrations may cause weakness, nausea, headache and agitation with or without progression to convulsions and coma. Cyanogen chloride has additional symptoms including coughing, dyspnoea and lachrymation due to intense local irritation; survival may be accompanied by pulmonary oedema.

PRINCIPLE
Cyanide agents act by inhibiting the cytochrome oxidase system to cause respiratory failure.

Treatment

35. Treatment for cyanides must be immediate in the event of high exposures. No treatment is required for casualties who are conscious and breathing normally more than five minutes after exposure. Oxygen and respiratory support should be administered initially. Dicobalt edetate provides binding sites for cyanide ions, allowing for reactivation of cytochrome oxidase. Binding sites are also provided by methaemoglobin, which is produced by the administration of sodium nitrite or 4-dimethylaminophenol (DMAP). Dicobalt edetate is given intravenously in doses of 600 mg. The dose of sodium nitrite is 300 mg intravenously over 3 minutes, and the dose of DMAP is 250 mg by slow intravenous injection.

35. Cyanide detoxification is achieved with sodium thiosulphate, which converts cyanide ions to thiocyanate, which is in turn rapidly excreted. Sodium thiosulphate should be given to supplement all other forms of treatment. The dose of sodium thiosulphate is 12.5 g intravenously over ten minutes. Cyanogen chloride exposure may also require treatment as per lung damaging agent protocols.

PRINCIPLE
Treatment of cyanide agent poisoning requires dicobalt edetate, sodium nitrite and sodium thiosulphate.

OTHER CHEMICAL AGENTS

37. Other possible chemical agents include:

- incapacitants such as 3-quinuclidinyl benzoate (BZ) and D-lysergic acid diethylamide (LSD);
- riot control agents such as tear gas (CS) and Mace (CN); and
- vomiting agents such as diphenylaminearsine (DM).

38. These agents are generally solids which are disseminated as smoke. They are non-persistent and act by various means to cause transient incapacitation. Treatment is symptomatic.

CHEMICAL AGENT DETECTION

39. Rapid detection and identification of agents is crucial to the appropriate management of casualties. Agent identification determines the level of responder protection required, and priorities for immediate treatment and decontamination. Agent monitoring is also essential to ensuring adequacy of decontamination.

PRINCIPLE
Agent detection and identification is fundamental to casualty management and responder protection.

40. The use of chemical agents may be suspected based on the presence of:

- large numbers of non-trauma casualties;
- casualties located in a specific geographical area or areas;
- numerous dead animals;
- evidence of munitions or dispensers; or
- claims by terrorist groups.

41. Accurate intelligence may give advance information on the type of agents used. In order to make a rapid diagnosis, a working knowledge of the symptoms and signs produced by CBR agents and their time of onset are needed, along with expert technical assistance. The inevitable presence of psychological casualties should not be overlooked, as they will complicate the diagnostic process.

42. Detector papers and kits, Draeger tubes (for Lewisite) and electronic instruments such as the chemical agent monitor (CAM—nerve and vesicant agents only) are available for the detection and/or identification of a variety of liquid and vapour nerve, vesicant, cyanide and lung damaging agents. These devices do not have universal application.

PRINCIPLE
Specific agent identification requires specialist equipment and support.

CHEMICAL GENERAL/MASS CASUALTY MANAGEMENT

43. Appropriate control of the incident site is essential to the management of chemical agent casualties. Isolation of hazard areas is required based on the detection and identification of agents, and decontamination and treatment areas must be established upwind of the hazard. Emergency services personnel must be protected by the use of personal protective equipment (PPE) and restriction of exposure. Contaminated casualties should be decontaminated before care is instituted to limit agent absorption. The provision of accurate casualty advice to hospitals will also be required to enable preparations to be made. As hospitals will likely receive contaminated casualties directly, they must be prepared to undertake all components of casualty management within their own resources.

44. Triage of mass casualties will be essential to ensure the optimum utilisation of health resources. Where appropriate, specific antidotes must be given rapidly, based on clinical presentation alone if necessary, to ensure survival. Once this is achieved, triage may be directed towards conventional/combined injuries. Further basic and advanced life support treatment and evacuation will follow. Continued supportive and definitive care utilising hospital facilities will likely be required for severe nerve and vesicant agent casualties. Psychological cases will complicate casualty management, especially as diagnosis may be difficult.

45. The provision of accurate and detailed information to the media and the public on the type and nature of agents, their distribution, effects and treatment, including decontamination requirements, will be essential to limit distress and panic.

PRINCIPLE

The key elements of management of a chemical incident are incident site control, casualty triage, decontamination and treatment, and communication.

BIOLOGICAL AGENT TYPES, EFFECTS AND TREATMENT

Background

46. Biological agents comprise a range of live biological organisms and their products (toxins and venoms) which are intended to kill, seriously injure or incapacitate. Toxins and venoms may also be regarded as chemical agents. Biological agents are unique in their ability to inflict large numbers of casualties over a wide area with minimal logistical requirements and by means which can be virtually untraceable. The ease and low cost of producing these agents, the difficulty in detecting their presence and protecting (and treating) their intended victims, and the potential to selectively target humans, animals, or plants conspire to make defence against this class of agent particularly difficult.

47. Biological agents have been used for centuries to poison water supplies and produce disease in susceptible populations. Plague was effectively employed against a Chinese city during World War II, and in 1979 the accidental release of aerosolised anthrax in the former Soviet Union resulted in over 100 cases of illness and 66 deaths.

Routes of Absorption

48. As for naturally occurring disease, biological agents may enter the body by inhalation, ingestion or through the skin. The most effective means of delivering agents is by aerosol, which results in a rapid spread and onset of disease, often at doses lower than those associated with naturally acquired infections. Aerosols may be generated by spray or explosive devices, and secondary aerosols may be generated from infected persons and contaminated materials. The ideal respiratory size of aerosol particles is 2–6 μ. Direct contamination of food and water may also occur although cooking of food and filtration and chlorination of water significantly reduce biological agent hazards. Only T2 mycotoxins are able to penetrate intact skin. Vectors such as insects may also be used in exceptional circumstances.

Agent Characteristics

49. Biological agents include a range of bacteria (free-living single-celled organisms), viruses (organisms requiring living cells for replication), rickettsiae (organisms possessing characteristics of both bacteria and viruses), chlamydia (obligate intracellular parasites), fungi (primitive plants), toxins (poisons derived from living organisms) and venoms. These organisms vary greatly in their behaviour, the diseases they produce, and their response to treatment.

50. The principal characteristics of biological agents which affect their potential for use include their:

- infectivity (the number of organisms required to cause disease);
- virulence or toxicity (the relative severity of the resulting disease);
- pathogenicity (the capability of agent to cause disease);

- incubation period (the time between exposure and symptoms);
- transmissibility (the ability to be spread from person to person;)
- lethality;
- stability (viability under environmental conditions); and
- ease of production, storage and delivery.

Unique to many of these agents, and distinctive to their chemical counterparts, is their ability to multiply in the body over time and thus increase their effect.

51. Other factors may influence the use of biological agents. Immunity in the target population will decrease their utility. Genetic engineering may also be used to modify naturally occurring organisms to enhance their effectiveness as agents. Environmental conditions, particularly sunlight and heat, will significantly degrade the performance and viability of agents, thus their delivery by aerosol at night during an atmospheric inversion is favoured. A few biological agents are persistent, but most are non-persistent. Toxins are non-volatile and thus persistent.

52. Many organisms may be used as biological agents. Examples of a number of these follow.

PRINCIPLE

Biological agents have unique characteristics and can be rapidly absorbed through the respiratory tract and gut to cause disease.

BIOLOGICAL—BACTERIA

Anthrax

53. Bacillus anthracis is a spore forming bacteria, which under natural circumstances causes cutaneous lesions. It is very persistent in the environment. If used as a biological agent, it would likely be delivered as an aerosol, resulting in inhalational anthrax. The organism multiplies in the lymphatic system and produces a toxin. The lethal inhalational dose is 8000–20,000 organisms.

54. The incubation period following inhalation is 1–6 days. Initial symptoms and signs are non-specific fever, malaise and fatigue, and occasionally cough. Within 2–3 days dyspnoea, tachycardia and then severe respiratory distress ensue, followed rapidly by shock and death.

55. Diagnosis is made by clinical assessment and the findings of a grossly widened mediastinum on chest x-ray, gram stain of blood, blood culture, smears from pleural or cerebrospinal fluid, and blood toxin detection. Treatment is by intravenous ciprofloxacin plus supportive therapy for shock and a single dose of vaccine. Prophylaxis is provided by vaccine with doses at 0, 2 and 4 weeks then 6, 12 and 18 months, and oral ciprofloxacin. After exposure, oral ciprofloxacin should be continued for four weeks, accompanied by additional vaccine doses. Mortality in untreated cases is 100%.

PRINCIPLE

Pulmonary anthrax causes respiratory failure and death in unprotected and untreated individuals; ciprofloxacin is the treatment of choice.

Plague

56. Yersinia pestis is a gram-negative coccobacillus which is naturally transmitted by the rat flea and causes bubonic plague. As a biological agent it would likely be delivered as an aerosol, causing pneumonic plague. The organism rapidly multiplies in the lungs. The infectious dose is less than 100 organisms.

57. The incubation period following inhalation is 2–3 days. Initial symptoms and signs include malaise, high fever, headache, myalgia, cough with bloody sputum and toxaemia. Rapidly progressing pneumonia, dyspnoea, disseminated intravascular coagulation, shock, respiratory failure and death follow.

58. Diagnosis is made by clinical assessment and sputum or cerebrospinal fluid smears, serology and cultures. Treatment is by intravenous doxycycline and supportive therapy. Person to person transmission is high and barrier nursing with masks is essential. A prophylactic vaccine with doses at 0, 1 and 6 months is available but its effectiveness against pneumonic plague is unknown. Oral doxycycline provides effective prophylaxis. Mortality in untreated cases is 100%.

PRINCIPLE
Pneumonic plague causes respiratory failure and death in unprotected and untreated individuals; it is highly transmissible and doxycycline is the treatment of choice.

Tularemia

59. Francisella tularensis is a gram-negative coccobacillus which is naturally transmitted by inoculation of skin and mucous membranes with infected blood and tissue fluids, insect bites, inhalation of contaminated dust or ingestion. It is stable in the environment. As a biological agent it would likely be delivered as an aerosol, and the inhalational infectious dose is only 10–50 organisms.

60. The incubation period of the typhoidal form of the disease following inhalation is 3–5 days. Symptoms and signs include non-specific fever, headache, malaise, prostration, weight loss and non-productive cough. Pneumonia may follow.

61. Diagnosis is made by clinical assessment, chest x-ray and serology. Treatment is by parenteral gentamicin. A prophylactic vaccine is under development. Oral tetracycline is an effective post-exposure prophylaxis. Mortality in untreated cases is 30%.

PRINCIPLE
Typhoidal tularemia causes incapacitation and occasionally death in unprotected and untreated individuals; gentamicin is the treatment of choice.

BIOLOGICAL—VIRUSES

Smallpox

62. Variola is an orthopoxvirus which is naturally transmitted by fomites and aerosols and is very stable outside the host. It is highly transmissible and the infectious dose is 10–100 organisms.

63. The incubation period following inhalation is 10–17 days. Symptoms and signs include malaise, fever, headache, backache and vomiting followed by typical macular and vesicular skin eruptions predominantly on the face and extremities. Some casualties develop a haemorrhagic form of the disease or a variety of other complications such as arthritis or osteomyelitis.

64. Diagnosis is made by clinical assessment and by various laboratory techniques including serology. Treatment is by vaccinia-immune globulin together with vaccination within a week of exposure and supportive care. Quarantine and the use of universal precautions, including the destruction of consumables, clothes, bedding and waste, is required to prevent transmission. Prophylaxis is by vaccination in a single dose. Mortality in unvaccinated individuals is 35%.

PRINCIPLE
Smallpox causes incapacitation and often death in unprotected individuals; it is highly transmissible and no specific treatment is available.

Venezuelan Equine Encephalitis

65. Venezuelan equine encephalitis virus is an alphavirus naturally transmitted by mosquitoes but as a biological agent it would likely be delivered as an aerosol. The infective dose is 10–100 organisms.

66. The incubation period following inhalation is 1–5 days. Symptoms and signs include sudden generalised malaise, spiking fever, severe headache, photophobia and myalgia followed by nausea, vomiting, cough and diarrhoea. Encephalitis may also occur. A subsequent period of aesthenia and lethargy lasts for 1–2 weeks.

67. Diagnosis is made by clinical assessment and specialised laboratory serology techniques. Treatment is symptomatic and supportive. Prophylaxis is by a developmental vaccination in a single dose.

PRINCIPLE
Venezuelan equine encephalitis causes incapacitation in unprotected individuals; no specific treatment is available.

Congo–Crimean Haemorrhagic Fever (CCHF)

68. Congo-Crimean haemorrhagic fever virus is an RNA virus of the Bunyaviridae family. It is transmitted naturally by ticks, although as a biological agent it would likely be delivered as an aerosol. The virus activates cytokines, affects clotting cascades, and damages vascular endothelium resulting in haemorrhage. The infective dose is 1–10 organisms.

69. The incubation period following inhalation is 3–12 days. Initial symptoms and signs include fever, flushing, conjunctival injection and myalgia, followed by bruising and bleeding from multiple sites, jaundice, severe headache, lumbar pain, nausea, vomiting and delirium. Death is caused by shock. Convalescence in survivors is prolonged.

70. Diagnosis is made by clinical assessment and antigen detection in serum. Treatment is supportive and by intravenous ribavirin. Strict barrier nursing including the use of masks and careful handling of sharps and contaminated materials is required to prevent transmission. Oral ribavirin provides prophylaxis for high-risk personnel. Ribavirin may also be used for post exposure treatment. Mortality in untreated cases is 15–30 per cent.

PRINCIPLE
CongoCrimean Haemorrhagic Fever often causes shock and death in unprotected individuals; it is highly transmissible and ribavirin is the treatment of choice.

BIOLOGICAL—RICKETTSIAE

Q Fever

71. Coxiella burnetti is naturally transmitted as airborne particles. The organism is stable and highly infectious; a single inhaled organism may cause disease.

72. The incubation period is 10–20 days. Symptoms and signs include fever, cough, headache, fatigue, myalgia, pleuritic chest pain and pneumonia. Recovery after 1–2 weeks is usually uneventful but complications, including hepatitis and endocarditis, occasionally occur.

73. Diagnosis is made by clinical assessment, chest x-ray and serology. Treatment is by tetracycline. Vaccination in a single dose provides effective prophylaxis.

PRINCIPLE
Q Fever causes incapacitation in unprotected and untreated individuals; tetracycline is the treatment of choice.

BIOLOGICAL—TOXINS

Botulism

74. Clostridium botulinum toxin affects the peripheral cholinergic presynaptic neuron membrane to prevent release of acetylcholine and block

neurotransmission. Botulinum toxin is the most toxic of all substances. The LD_{50} is 0.001 µg/kg (the LD_{50} for the nerve agent VX is 15 µg/kg).

75. Initial symptoms and signs begin 24–36 hours following inhalational exposure. They include ptosis, generalised weakness, lassitude, dizziness, sore throat due to decreased salivation and urinary retention or ileus. Later symptoms and signs include blurred vision due to mydriasis, diplopia, photophobia, dysarthria, dysphonia and dysphagia, followed by symmetrical, descending progressive weakness and flaccid paralysis of the extremities and respiratory muscles. Death is caused by respiratory failure.

76. Diagnosis is made by clinical assessment although toxin may be detected in serum. Treatment comprises early administration of antitoxin and supportive care including ventilatory assistance. Prophylaxis is provided by toxoid, currently developmental, with doses at 0, 2 and 12 weeks and an annual booster.

PRINCIPLE
Inhaled Botulinum toxin rapidly causes respiratory failure and death in unprotected and untreated individuals; antitoxin is the treatment of choice.

Staphylococcal Enterotoxin B

77. Staphylococcus aureus toxin stimulates the secretion of cytokines, which mediate its toxic effects. The ID_{50} is 30µg.

78. Symptoms and signs commence 3–12 hours after inhalational exposure. They include fever, headache, myalgia, cough and occasionally dyspnoea, chest pain, nausea and vomiting.

79. Diagnosis is made by clinical assessment although toxin may be found in serum. Treatment is supportive and resolution occurs after 1–2 weeks. No prophylaxis is available.

PRINCIPLE
Inhaled Staphylococcal enterotoxin B rapidly causes incapacitation in unprotected individuals; no specific treatment is available.

Ricin

80. Ricin from castor beans kills cells by inhibiting protein synthesis. It is readily available, stable and has extreme pulmonary toxicity when inhaled. The LD_{50} is 3–5µg/kg.

81. Symptoms and signs commence 24–36 hours after inhalational exposure. They include non-specific weakness, fever, cough, pulmonary oedema, shock and death. Ingestion results in gastrointestinal haemorrhage with necrosis of the liver and spleen.

82. Diagnosis is made by clinical assessment and serology. Treatment is supportive. No prophylaxis is available.

PRINCIPLE
Inhaled ricin rapidly causes shock and death in unprotected individuals; no specific treatment is available.

BIOLOGICAL AGENT DETECTION

83. Biological agents are difficult to detect and identify. Clinical diagnostic, epidemiological and laboratory techniques are the key methods employed. Increased surveillance is required. Automated devices, which are able to detect biological agents in air, are also under development. A high index of suspicion of the use of biological agents should be maintained. As for chemical agents, terrorist claims and/or the presence of munitions or dispensers may provide valuable evidence.

84. In a naturally occurring epidemic, there is usually an initially small number of patients with similar signs and symptoms, followed by a lag period before other cases present. Biological agents will generally cause large numbers of casualties in a specific geographical area or areas over a short period of time, often after favourable environmental conditions have occurred. The presence of cases with similar, usually severe and often respiratory related symptoms, a high fatality rate, unusual diseases and disease progression patterns, and deaths in animals are typical features of the use of biological agents. Low attack rates will occur in protected persons.

85. Laboratory specimens obtained for testing should include blood cultures, serum and samples from involved lymph nodes, sputum, pleural and cerebrospinal fluid as well as the liver and spleen if possible. Brain and other tissues should be taken for analysis from post mortem cases. The results of tests, including from those from reference laboratories, may take several days, with the minimum time for identification of an agent being approximately 12 hours. Effective laboratory networks are required. Cultures, mass spectroscopy, antibody and antigen detection methods and DNA probes are some of the laboratory identification techniques employed.

PRINCIPLE
Specific agent identification requires specialist epidemiological and laboratory support.

BIOLOGICAL GENERAL/MASS CASUALTY MANAGEMENT

86. Site management is required as for chemical incidents, although the nature of biological incidents may limit the relevance of the site of agent dissemination.

87. Vaccines and toxoids are available against some biological agents. Community immunity reduces the likelihood of agent use, however achieving such immunity is difficult. The delivery of large numbers of organisms in aerosol form may also provide a reduced degree of vaccine protection compared to natural disease exposures. Furthermore, vaccines may not protect against all subtypes and strains of organisms, particularly if they are genetically engineered. Some vaccines are effective if given immediately post exposure. Prophylaxis with broad-spectrum antibiotics may offer additional protection against some agents, although the likelihood of an incident would have to be high, as their

widespread use is wasteful and hazardous. Such antibiotics include tetracycline and ciprofloxacin.

88. Until a definitive diagnosis is made, the management of biological casualties should follow a number of general principles. Supportive measures should be taken to lower temperature, relieve pain, maintain respiration and treat other symptoms. Separation of non-affected individuals from casualties (reverse quarantine) and implementation of barrier nursing procedures should be initiated as soon as practicable to prevent cross-infection with transmissible agents.

89. Antibiotics must be given to all biological casualties, even without a firm diagnosis, as most bacterial, chlamydial and rickettsial diseases respond to antibiotics. One broad-spectrum antibiotic should be administered in full therapeutic doses, preferably intravenously, commencing at the earliest possible level of care. The choice of antibiotic will depend upon many factors, including the specific threat, evidence or suspicion of antibiotic resistance, and the ease with which drug resistance can be artificially engineered.

90. The only 'broad-spectrum' antiviral drug currently available is ribavirin, which has been used to treat some potential viral threats when they have occurred naturally (Lassa fever, Congo-Crimean haemorrhagic fever, haemorrhagic fever with renal syndrome). There is also evidence of activity against certain other viruses (influenza, Junin virus, Rift Valley fever). Other drugs such as amantadine, acyclovir and azidothymidine are restricted in their therapeutic spectrum to single virus families. Interferon may also be of value.

91. Significant changes may be required in the provision of basic health care in a mass biological casualty situation. Many casualties can be cared for in the home and, for the vast majority, no special support such as X-ray facilities, oxygen therapy, or surgical care will be needed. Biological toxins are an important exception, as dramatic, acute signs such as respiratory paralysis necessitate advanced equipment (eg. ventilators).

92. Limited numbers of physicians, supported by other health care providers, may have to care for several hundred patients. Information could be disseminated to carers about the normal course of the disease, specific signs or symptoms of adverse prognostic significance, situations requiring individual health attention or advice, and procedures for obtaining essential medical supplies.

93. It is also essential to allay panic. This could be done effectively if everyone in the area is assured that the cause of the disease is known, and its course and outcome are described. An accurate diagnosis shortly after the onset of illness would thus be required. If this assurance cannot be provided, the psychological response might create greater problems than the disease itself.

PRINCIPLE

The key elements of management of a biological incident are quarantine, broad spectrum drug treatment, supportive care and communication.

RADIOLOGICAL EFFECTS AND TREATMENTS

Background

94. Radiological incidents may result from armed conflict, terrorist activities, or industrial or medical incidents. Such incidents occurring due to the detonation of a thermo-nuclear device may result in casualties suffering from a combination of blast, thermal and radiation injuries. This combination significantly complicates casualty management. In industrial or medical incidents, injuries are primarily due to ionizing radiation.

95. Injuries secondary to accidental exposure to ionizing radiation are relatively infrequent. Between 1941 and 1990, 327 such accidents in which one or more persons received significant exposure were reported worldwide. The majority of these involved sealed radioactive sources or X-ray machines. One hundred and two persons have died, but this does not include deaths due to the later development of neoplastic disorders. The worst accident occurred at Chernobyl in 1986 and resulted in 500 people receiving significant radiation exposure, with 237 casualties hospitalised and 32 deaths.

Agent Characteristics and Effectiveness

96. Ionising radiation comprises four basic types: Alpha particles (helium nuclei); Beta particles (electrons); Gamma and X-rays (electromagnetic radiation); and Neutrons. These types have different physical characteristics and biological effectiveness in causing tissue damage, as summarised below.

Type	Range in Air	Range in Tissue	Hazard
Alpha	Few cm	50 micron	Problem if source ingested
Beta	Few metres	Few mm	External and internal, burns
Gamma	Many metres	Many cm	Mainly external
X-rays	Many metres	Many cm	Mainly external
Neutrons	Many metres	Many cm	Mainly external, except at lethal dose does not cause radioactive contamination of casualty

97. The dose of radiation absorbed by the body is measured as the Gray (Gy). The Sievert (Sv) is the measure of the relative biological effectiveness of the type of radiation and is of greater importance in assessing long-term effects. Radiation pathogenesis is measured as the LD_{50}, which is the dose which causes death in 50% of the exposed population. As there is usually a time delay before radiation takes effect, a time factor is added to the LD_{50}. The $LD_{50/60}$ is the dose which causes death in 50 per cent of the exposed population within 60 days. The $LD_{50/60}$ for a single acute exposure to gamma radiation in untreated individuals is 450–500 cGy. Doses less than 100 cGy are unlikely to produce symptoms.

Routes of Absorption

98. Penetrating (gamma, x-ray and neutron) radiation is absorbed directly into the body. In this situation, casualties are not contaminated and they pose no risk to others. Alpha and beta radiation may be present externally on the clothing, skin

or in wounds, or internally following ingestion, inhalation or absorption through skin, mucous membranes and wounds. Radioactive contamination may be a source of continuous whole body or localised exposure to radiation. External contamination may also comprise a small risk to others if they do not cover their exposed body surfaces which touch the casualty. Internal contamination presents a risk if contact is made with the casualty's urine or faeces.

99. Following internal contamination, radioactive atoms or molecules may become incorporated into the patient's tissues, for example, radioactive iodine may incorporate into thyroid tissue, caesium to muscle, and strontium and phosphorus into the bone.

PRINCIPLE
Radiation types can be highly penetrating or absorbed through the respiratory tract, mucous membranes, skin and gut.

Actions and Clinical Effects

100. Radiation acts by direct cellular damage and indirectly by the formation of free radicals. The relative biological effect of radiation is proportional to the size and charge of particles or, in the case of electromagnetic radiation, inversely proportional to the energy, due to the transfer of energy to the tissue. Other factors influencing the clinical effects of radiation are the:

- total dose and rate of radiation;
- area of body/organs exposed;
- age of affected individual; and
- presence of fatigue, impaired nutritional state or other injuries.

101. Local radiation effects depend on the tissue exposed. Skin develops delayed erythema progressing to ulceration with delayed healing due to subcutaneous vascular damage. The eyes develop cataracts and joints become stiff due to cartilage damage. Treatment of local injury depends on its nature and extent.

Acute Radiation Sickness

102. High dose whole body irradiation occurring over a short period of time may result in acute radiation sickness. Rapidly dividing cells such as those in bone marrow and the gut are most affected. There are three characteristic syndromes which comprise acute radiation sickness—haemopoietic, gastrointestinal and neurovascular. These occur in turn with increasing radiation dose.

103. The haemopoietic syndrome is the result of bone marrow damage at low to mid-lethal radiation doses. The gastrointestinal syndrome, which is the combined result of bone marrow and gastrointestinal tract damage, occurs at radiation doses above the mid-lethal range. The neurovascular syndrome occurs at radiation doses above the lethal range.

104. The clinical course of acute radiation sickness is an initial symptomatic (prodromal) phase occurring during the first few hours after exposure, followed by a symptom-free (latent) phase, then a second symptomatic phase, and recovery or death. The time of onset and the degree of incapacitation

associated with the initial symptomatic phase, the duration of the symptom-free phase and the severity of the second symptomatic phase are dependent on the radiation dose. In severe cases, the rapid progression of the illness makes differentiation of the various phases impossible.

105. The initial symptomatic phase, commencing within minutes to hours, features non-specific early onset nausea, vomiting, anorexia and malaise and lasts for up to a few hours. Hyperthermia and diarrhoea may also occur following severe radiation doses, with erythema appearing after lethal doses, and burning sensations, hypotension and rapid incapacitation occurring with supralethal doses. The symptom-free phase commences 8–24 hours after exposure and its length varies markedly from 1–3 weeks if succeeded only by the haemopoietic syndrome, to a matter of hours if succeeded by the neurovascular syndrome. Thus the symptoms of radiation sickness are often an unreliable diagnostic guide until the onset of the second symptomatic phase.

PRINCIPLE

Radiation damages rapidly dividing cells resulting in local and systemic effects of variable onset and severity, depending on the radiation dose, type and distribution.

Haemopoietic Syndrome

106. The haemopoietic syndrome is based on depression of bone marrow function and follows a minimum dose of approximately 100–150 cGy. Mild initial symptoms are delayed for several hours and soon improve. Lymphocyte depression commences as early as 24 hours after exposure, although erythrocyte numbers are usually maintained. The clinical problems of haemorrhage, decreased resistance to infection, anaemia and delayed wound healing occur one to three weeks after exposure. The diagnosis of radiation induced bone marrow depression is suggested by means of a peripheral blood count with typical pancytopaenia.

Gastrointestinal Syndrome

107. The gastrointestinal syndrome results from a single acute dose of at least 800 cGy and overlays the features of the haemopoietic syndrome, which commences earlier than indicated above. Moderate initial symptoms are followed by a symptom-free period of a few days to a week. The syndrome features vomiting and severe diarrhoea with serious fluid losses, fever and haemorrhage, due to the physiological derangement of epithelial cells followed by a loss of intestinal mucosa and submucosal vascular damage. A differential diagnosis should include sublethal haemopoietic depression complicated by gastrointestinal infection. A peripheral blood count will show pancytopaenia. The prognosis is serious because of the induced shock and associated unrecoverable bone marrow damage.

Neurovascular Syndrome

108. The neurovascular syndrome occurs only after very high acute doses of radiation, usually above 1500–2000 cGy, and overlays the features of the gastrointestinal syndrome. The initial symptomatic phase is often accompanied by very early transient incapacitation. The symptom-free phase ranges from hours to a few days and is followed by respiratory distress, a rapidly deteriorating state of consciousness, coma and death due to massive failure of

the microcirculation, direct nervous system damage and the release of toxic cell products.

PRINCIPLE
The components of acute radiation sickness are the haemopoietic, gastrointestinal and neurovascular syndromes, of which only the haemopoietic is likely to be survivable.

Diagnosis

109. Diagnosis of acute radiation sickness is primarily based on the clinical presentation and serial peripheral blood counts commencing 24 hours after exposure. Lymphocyte levels between 1000 and 1500/mm^3 indicate the need for treatment within three weeks, between 500 and 1000/mm^3 the need for treatment for severe radiation injury, less than 500/mm^3 a likely fatal outcome, and zero detectable a supralethal exposure. Dicentric lymphocyte chromosomal abnormalities also occur early but analysis takes 48 hours. Increasing age, poor physical condition, and concomitant disease and stress adversely affect prognosis. Dosimetry, if available, will not give adequate information on the extent of injury, eg. whole body or partial, or dose rate.

PRINCIPLE
Diagnosis of acute radiation sickness is based on lymphocyte counts.

Chronic Effects

110. Delayed effects of ionising radiation may not be expressed clinically until one or more years after the original exposure, which in some cases may have been insufficient to cause acute symptoms. Chronic radiation effects include infertility, cataracts, malignancies and birth abnormalities.

Treatment

111. The treatment of acute radiation sickness depends on the extent of the injury. Casualties should be assessed as ‘radiation injury unlikely’, ‘radiation injury probable’, or ‘radiation injury severe’ depending on symptoms and lymphocyte levels. If contamination with particulate or liquid radioactive materials has occurred, decontamination should immediately follow triage where possible, in order to reduce further exposure.

112. Elimination of inhaled, ingested or absorbed radionuclide may be undertaken by the use of blocking, mobilising or chelating compounds. The compounds used and the rate of elimination will depend on several factors, including the type of radionuclide, its size, and the organs in which uptake has occurred.

113. If a significant radiation injury has been suffered, casualties should be monitored for pancytopaenia complications and treated accordingly and aggressively with antibiotics, isolation nursing, and fluids and electrolytes as required. For moderate and severe radiation injuries, symptomatic care, including antiemetics and fluid, electrolyte and nutritional replacements should be given. Trauma, including burns, accompanied by significant radiation injury has a much worse prognosis than trauma alone, and triage must reflect this. Conventional injuries must be treated conventionally, with any essential surgery

performed within one or two days of exposure because of the rapid onset of pancytopaenia associated with radiation injury. The use of platelet transfusions, cytokines and colony stimulating factors to stimulate the bone marrow, immunomodulators, and stem cell and bone marrow transplant should be considered, with the last of these required in the first 14 days post exposure to facilitate effectiveness. Only one of the Chernobyl casualties who were exposed to greater than 600 cGy survived in spite of extensive treatment.

114. Long term follow up is required for leukaemia, other cancers, reproductive and other problems.

PRINCIPLE
Treatment of radiation injury comprises decontamination as required, radionuclide elimination, supportive care and management of bone marrow depression.

RADIOLOGICAL AGENT DETECTION

115. Radiological incidents may be difficult to detect unless notified or evidence of a source is found. Specialised personal dosimeters may be used to determine exposure to gamma and neutron radiation. However, they are unlikely to be available to anyone other than emergency services personnel responding to a CBR incident after the event, thus they will be of no relevance to immediate casualties. Dosimeters are also unable to differentiate between single and cumulative radiation doses, and whole or partial body exposure. Radiac meters are used to detect residual gamma and beta radiation. Special instruments or modified radiac meters are required to detect alpha radiation. The type of instrument used will thus depend on the nature of the contaminants. State radiation safety experts are able to assist in providing detection equipment and expertise. As stated, blood analyses are the most useful readily available means of assessing the absorbed radiation dose. Nasal and oral swabs and urine and blood samples may provide further evidence of inhalation and/or ingestion.

PRINCIPLE
Radiation detection requires specialist equipment and support.

RADIOLOGICAL GENERAL/MASS CASUALTY MANAGEMENT

116. General site management is undertaken as per chemical incidents.

117. The principles of triage and resuscitation of acute life threatening injuries take precedence over radiation exposure, as neither contamination nor the receipt of other than massive doses of irradiation cause acute patient illness. Decontamination is undertaken as required and casualties are treated symptomatically for the initial symptoms of acute radiation sickness. Blood and other biological samples are collected for biological dosimetry which can give an indication of prognosis. An assessment is made of acute local radiation injury and conservative management is initiated. Attention must be paid to the psychological welfare of the patient. Normal medical and nursing procedures should be followed as closely as possible.

118. Quantification of the degree of radioactive contamination and identification of the type of radioactive material present is important for diagnosis, prognosis and correct definitive treatment. The information is required as soon as possible and subsequent medical management is guided by health physicists.

119. As for chemical and biological agents, the provision of accurate and detailed information to the media and the public on the type and nature of radiological hazards, their distribution, effects and treatment, including decontamination requirements, will be essential to limit distress and panic.

PRINCIPLE
The key elements of management of a radiological incident are incident site control, casualty triage, decontamination and treatment, and communication.

DECONTAMINATION (ALL AGENTS)

120. Decontamination is required to limit absorption of agent by casualties and to prevent the exposure of emergency services personnel and contamination of treatment facilities. Decontamination requirements are determined by the agent used, environmental conditions and time, with chemical agents being the greatest threat and persistent agents posing greater problems than non-persistent agents. The general aim is to reduce an initial liquid hazard to a vapour hazard then to remove all traces of contamination.

PRINCIPLE
Decontamination reduces agent absorption by casualties and exposure of responders.

121. The location chosen for gross and secondary on-site decontamination must be upwind from the contaminated incident site, downwind from the treatment site and secured with controlled entry and exit points. Hospitals require all levels of decontamination facilities, secured and separate from the remainder of the facility, as patients may be received without having been managed on site.

122. Decontamination consists of physical removal to displace the bulk of the agent (gross decontamination), and subsequent chemical deactivation or neutralisation (secondary and definitive decontamination). Physical removal involves removing contaminated clothes, flushing with water or aqueous solutions, scraping off contaminant, and/or the use of adsorbents.

123. Chemical deactivation compounds must be capable of neutralising agents, as well as being non-toxic, easy to apply, readily available, quick acting, stable, non-irritating and having safe byproducts. Chemical deactivation involves washing with soap and water, and oxidation (VX and HD), or hydrolysis (all nerve agents) with alkaline 0.5% sodium hypochlorite for skin and 5% sodium hypochlorite for equipment. Other kits may be used for spot skin decontamination, and to adsorb and neutralise agents. Soft tissue wounds are decontaminated by flushing with water or 0.5% hypochlorite. Body cavity and nervous tissue wounds are flushed with surgical irrigating solutions, while water or normal saline is used for eyes. Bandages are removed and only replaced after decontamination if bleeding recurs. Foreign bodies may harbour contaminants, especially vesicants and thickened agents, and they require removal as soon as possible. Contaminated items are disposed of in

impermeable containers with or without bleach or charcoal, while personal effects are bagged separately for subsequent decontamination and recovery. The effectiveness of decontamination is monitored with detection devices.

124. Secondary decontamination is followed by definitive decontamination, which involves more detailed application of secondary decontamination procedures, to ensure complete removal of agent.

125. Decontamination of emergency services personnel wearing personal protective equipment (PPE) differs significantly from casualty decontamination because of the specific procedures necessary to ensure that no respiratory or skin exposure occurs during personal protective equipment (PPE) removal or exchange.

126. The general principles of decontamination as stated above are applicable to all CBR agents, except where indicated below.

Chemical—Nerve and Vesicant

127. Decontamination of nerve and vesicant agents must commence within minutes of exposure to minimise absorption through skin, and skin damage and absorption respectively.

Other Chemical

128. Because of their volatility, decontamination is not required for either lung damaging or cyanide agents. Hypochlorite should not be used for decontamination of riot control agents, rather alkaline sodium bicarbonate is required.

Biological

129. Decontamination of biological agents is undertaken as for chemical agents. Contaminated clothing, used consumables and patient fluids and waste must be carefully disposed of with disinfectants or burning. Universal infection control precautions are also required, with barrier nursing necessary in the case of pneumonic plague, smallpox and viral haemorrhagic fevers due to their high transmissibility. Sporicidal agents such as chlorine and concentrated iodine are required for disinfecting anthrax cases.

Radiological

130. No decontamination is necessary if exposure is limited to penetrating radiation from external sources. Decontamination of casualties exposed to radioactive particulates is undertaken as for chemical agents; simply removing clothing followed by showering is 95% effective. Monitoring of casualties for alpha, beta and gamma radiation is essential to assess the presence and degree of contamination. Inhalation or ingestion of particulates and subsequent absorption may result in severe systemic radiation doses, thus decontamination of the nose and oropharynx (after swabs are taken for analysis) may be necessary, along with emetics, gastric lavage and purgatives, and, depending on the radionuclide, the use of substances to block uptake, displace, mobilise and/or chelate the agent. Persistent skin contamination may be remedied by the use of mild detergent. Contaminated wounds will require thorough debridement and removal of foreign bodies, and rotation of attending health

personnel will reduce their exposure. Contaminated clothing and consumables must be disposed of appropriately.

PRINCIPLE
Decontamination consists of gross, secondary and definitive components and agent monitoring.

PERSONAL PROTECTION

General/Chemical

131. Personal protective equipment (PPE) is required for effective protection against most CBR agents, particularly all types of chemical agents. PPE permits personnel to move safely and independently in a contaminated environment. Complete PPE comprises a full-face respirator with or without supplied air or self contained breathing apparatus and purpose-designed impermeable or semi permeable clothing including boots and gloves.

132. Filtration of air for lung powered and some pressurised air powered respirators is via canisters containing a high efficiency particulate (HEPA) filter and activated charcoal with metal salts. These canisters are effective against all the chemical agents previously addressed as well as particulates containing biological and radiological agents, although the duration of protection against cyanides is limited and little protection may be afforded against some industrial chemicals. Lung powered respirators are not effective against carbon monoxide and they cannot be used in a low oxygen atmosphere. Agents are adsorbed onto the charcoal and the HEPA filter traps particulates of respiratory size (approximately 0,3µ). The protection factor of lung powered respirators is approximately 10^4.

133. PPE imposes significant physiological stress through heat and breathing resistance and psychological stress through isolation from the external environment. Symptoms and signs of stress include hyperventilation, anxiety, performance impairment and collapse. Appropriate preparation and training will help to reduce the problems posed by PPE.

Biological

134. PPE or conventional clothing plus a surgical facemask and rubber gloves provide adequate protection against all biological agents except T—2 mycotoxins, as these penetrate exposed skin.

Radiological

135. Increasing the distance from the source will decrease exposure in accordance with the inverse square law, ie. doubling the distance will reduce the radiation intensity by one quarter. Thick concrete and earth shelters are required to provide protection against close-range penetrating gamma and neutron radiation. On the other hand, standard PPE is adequate for alpha and beta fallout radiation. In the case of fallout, the 7:10 rule also applies, ie. after a period of seven hours, the radiation dose is reduced by one-tenth.

PRINCIPLE
Specialised personal protective equipment is required to ensure the safety of responders, but performance impairment is associated.

COLLECTIVE PROTECTION

136. Collective protection offers the capability to manage casualties in an environment where attending personnel are unencumbered by PPE. Thus casualties are able to receive full benefit from medical equipment and procedures. Collective protection also allows personnel to rest and obtain relief from the use of PPE.

137. The minimum collective protection is sheltering in place. A purpose-designed collective protection facility requires a sealed shelter equipped with an airlock and an air filtration unit containing HEPA filters and providing pressure greater than ambient. Decontamination of casualties and personnel (as required) is necessary before they enter the facility.

Chemical

138. Partial collective protection, ie. a shelter without a full air filtration unit may be used where only a vapour hazard exists, except where the vapour is from a vesicant agent. In the presence of non-vesicant vapour, the use of respirators alone by casualties and attending personnel provides adequate protection. However, casualties who are unable to wear a respirator or who require definitive medical care need full collective protection facilities.

Biological

139. Partial collective protection may be used where only an aerosol hazard exists. Casualties with highly transmissible diseases—pneumonic plague, smallpox and viral haemorrhagic fevers—may be treated within collective protection if the facility is not housing patients with other diseases and attending personnel wear respirators. Universal infection control procedures with barrier nursing as required, appropriate disposal of waste materials, and careful handling of laboratory samples are also needed.

Radiological

140. Partial collective protection may be used where only a fallout particulate hazard exists. Appropriate disposal of contaminated foreign bodies removed from wounds is required.

PRINCIPLE
Collective protection is required to optimise casualty management and provide relief for responders.

MEDICAL RESPONSE TO CHEMICAL, BIOLOGICAL AND RADIOLOGICAL INCIDENTS

141. The general principles underlying the medical response to CBR incidents at incident sites and, to some extent, at receiving hospitals, may be described as:

- prevention and protection;
- detection and identification;
- decontamination;
- triage; and
- treatment and evacuation.

141. Education, training and practice are essential to ensure that these actions are effective. A comprehensive command, control and communication organisation is also required to ensure that the medical response is coordinated and unimpaired.

PRINCIPLE
The medical response to CBR incidents consists of prevention and protection, detection and identification, decontamination, triage, treatment and evacuation.

Prevention and Protection

143. Prevention and protection may include the following components, some of which may fall outside the health response:

- Pre-treatment and prophylaxis, especially for chemical and biological agents.
- Use of protective mask and clothing (including respirator)
- Incident site management.
- Collective protection of health care facilities.

144. Management of the incident site by the establishment of hazard zones will complement personal protection. Hot, warm and cold zones are based on the presence of liquid/solid and vapour/aerosol contamination, vapour/aerosol only, and no agent respectively. The hot zone is defined as the area immediately surrounding a CBR incident which extends far enough to prevent adverse effects to unprotected personnel outside the zone. The warm zone is the area where casualty, personnel and equipment decontamination and treatment and hot zone support takes place. The cold zone is where the command post and other support functions are located. Only personnel equipped with appropriate PPE are to enter the hot and warm zones under control of the site commander. Emergency services personnel entering the hot zone to undertake rescue, emergency decontamination and treatment should work in a minimum of pairs to ensure safety. Casualty management areas are established upwind from the hazard and supervised by safety officers. Caution should be exercised in light of the possible presence of secondary devices intended to injure emergency services personnel.

PRINCIPLE
The establishment of hot, warm and cold zones at the incident site provides protection for responders and the public.

Detection and Identification

145. Initial agent detection and identification are undertaken by visual assessment of the site and observation of casualty symptoms and signs. Intelligence sources may also assist. CBR agent identification specialists and equipment are required to ensure the protection of health care personnel and the community at large, and the provision of effective casualty management.

Decontamination

146. Casualties evacuated from the hot zone undergo gross decontamination by removal of clothes and showering/head to toe rinsing, concurrent with initial triage and basic life support actions with administration of antidotes as required. Combined decontamination and treatment teams will thus be essential. Secondary decontamination involving the use of 0.5% hypochlorite solution (if available), saline, rinsing and monitoring is then undertaken as required.

Triage

147. Triage is one of the most important tools for handling mass casualties. It is a continuous medical decision process undertaken throughout the casualty care chain to arrange casualties in priority order to ensure the most effective use of limited health resources and minimise morbidity and mortality. It should be utilised whenever casualties must be assigned priority for treatment, evacuation or decontamination. Triage decisions should be made by highly experienced personnel familiar with CBR and conventional injuries. Triage criteria should be determined in advance, and practised. They must also be relevant to the health capabilities of the health facility.

PRINCIPLE
Expert triage is essential to the management of mass casualties.

148. The standard mass casualty triage categories are as follows:

- ***Priority 1***—Immediate—The condition has a high chance of survival with the application of emergency lifesaving treatment of brief duration and involving limited resources.
- ***Priority 2***—Delayed (NSW—Urgent)—the condition allows delay in definitive treatment (NSW—4–6 hrs) although interim pain relief and other treatment may be required.
- ***Priority 3***—Minimal (NSW—Delayed)—The condition allows self-care or care by personnel with limited training (NSW—Casualties who do not require treatment in less than 6 hrs).
- ***Expectant***—The condition has a low chance of survival and required treatment is beyond the capabilities of the available health resources (this category is not accepted in NSW and some other civilian settings, and such patients are placed in the Delayed category).

- ***Dead***.

149. Alternately, the 'Sieve and Sort' triage system may be employed as follows:

- ***Sieve***—Categories apply as follows:
  - Casualties able to walk on their own are 'delayed'.
  - Casualties unable to breathe in spite of simple airway manoeuvres are 'dead'.
  - Casualties with <10 or >30 breaths per minute are 'immediate'.
  - Casualties with 10–29 breaths per minute and capillary refill >2 sec are 'immediate'.
  - All other casualties are 'urgent'.
- ***Sort***—Re-triage at the casualty treatment area uses the Triage Revised Trauma Score (TRTS) which employs the additional criteria of blood pressure and Glasgow coma score

150. The sieve and sort system does not allow for the actual nature of the injuries or the presence of contamination, which in the case of chemical agents may rapidly alter the casualty status as they are absorbed. Allowance must thus be made for these factors, particularly if trauma and CBR injuries are combined.

151. Examples of CBR casualty triage are as follows:

- Severe nerve agent poisoning—Immediate.
- Radiation injury with severe trauma/burns—Immediate.
- Moderate nerve agent poisoning improving after treatment—Delayed (NSW Urgent).
- Moderate vesicant agent poisoning—Delayed.
- Radiation injury with simple fractures/<25% burns—Delayed (NSW Urgent).
- Mild nerve agent poisoning—Minimal (NSW Delayed).
- Radiation injury 100–150 cGy with burns <10%—Minimal (NSW Delayed)

PRINCIPLE
Triage systems must be standardised and appropriate to the requirements of CBR casualties.

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Treatment and Evacuation

152. Only basic life support measures and life saving procedures, including antidote administration, should be performed in the decontamination area. Any invasive procedure performed before decontamination may expose the patient to increased amounts of the hazardous substance. The contamination of equipment, such as monitors, also needs to be considered during this phase. Once decontamination is complete or the hazard is minimal, as indicated by monitoring by the chemical/radiation safety officer, further medical management including advanced life support may be continued.

153. Diagnosis and management of psychological casualties will be difficult, and there will be a need to inform the media and public of the situation to minimise general distress and panic.

154. Casualty evacuation must take account of the likely contamination of specialised patient transport vehicles and the consequent need to employ general-purpose vehicles wherever possible. Casualties must also be distributed to a range of hospitals rather than to a single centre to ensure the appropriate coordination and utilisation of resources.

PRINCIPLE
Casualty evacuation must take into account likely contamination of vehicles.

155. Hospital-specific casualty management involves definitive decontamination and treatment, as well as administrative procedures to track and followup cases.

SUMMARY

156. While there is only a low probability of a CBR incident in Australia, such an incident has the potential not only to cause mass casualties, but also to complicate the medical management of such casualties due to its unique characteristics.

157. Preparation of all levels of health care services, including the development of protocols, acquisition of equipment and facilities, and training of personnel is essential to ensure an effective response.

158. Rapid detection and identification of agents is fundamental to site and casualty management. Protection of responding health care personnel is needed, as is effective decontamination, triage and rapid treatment of casualties to ensure their survival and prevent secondary casualties. Coordination and control of all stages is a key to the successful resolution of a CBR incident.

REFERENCES

159. References used in this Chapter are as follows:

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Medical Planning and Care in Radiation Accidents, Vol 3 No 3. September 1991, Part 2.

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- Christopher et al, **Biological Warfare—A Historical Perspective**, JAMA, August 6, 1997—Vol 278, No 5.
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- Swindon, T.N. **Manual on the Medical Management of Individuals involved in Radiation Accidents**, Australia Radiation Laboratory, September 1991.
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Special Note

160. A ‘Glossary of Terms’ used in this Chapter appears at Annex A and a List of Abbreviations’ used in this Chapter appears at Annex B.

GLOSSARY OF TERMS FOR CHAPTER SEVENTEEN

ANOREXIA	loss of appetite
ANTHRAX	bacillus anthracis, a spore-forming bacteria
ATROPINE	anticholinergic medication
BACTERIA	free-living single-celled microorganisms
BETA RADIATION	electron particles
BOTULINUM	clostridium bacteria of bacillaceae family
CHLAMYDIA	obligate intracellular parasites
CIPROFLOXACIN	type of quinolone antibiotic
CYTOKINE	cell stimulant
DEBRIDEMENT	removal of devitalised tissues
DIPLOPIA	double vision
DOSIMETRY	dose measurement
DYSARTHRIA	joint dysfunction
DYSPHAGIA	swallowing dysfunction
DYSPHONIA	speech dysfunction
DYSPNOEA	breathlessness
EMETICS	medications causing vomiting
EPISTAXIS	nasal bleeding
ERYTHEMA	skin redness
ERYTHROCYTE	red blood cell
FUNGI	primitive plants
GAMMA RADIATION	penetrating electromagnetic radiation
GRAY	measure of absorbed dose of radiation
HAEMOPOIETIC	production of blood cells
ID_{50}	dose of agent incapacitating to 50% of exposed unprotected individuals
LD_{50}	dose of agent lethal to 50% of exposed unprotected individuals
$LD_{50/60}$	radiation dose lethal to 50% of exposed individuals
LETHALITY	causing death
LEUCOCYTOSIS	increase in white blood cells
LEUCOPOENIA	reduction in white blood cells
LEWISITE	blister agent containing arsenic
LYMPHOCYTE	large white blood cell
MACULAR	a flat coloured spot
MEDIASTINUM	mass of tissues and organs separating the lungs
MIOSIS	contracted pupil
MYALGIA	muscle pain
MYDRIASIS	dilated pupil
OROPHARYNX	mouth and throat
OXIME	acetylcholinesterase reactivating medication
PANCYTOPAENIA	generalised reduction of blood cells
PHOTOPHOBIA	aversion to light
PROPHYLAXIS	prevention of illness
RADIAC	pertaining to radiation
RHINORRHOEA	nasal discharge
RICKETTIAE	microorganisms with characteristics of bacteria and viruses
SIEVERT	measure of relative biological effectiveness of radiation
STAPHYLOCOCCUS	spherical bacterium of micrococcaceae family

TOXINS	poisonous substances produced by plants, animals and pathogenic bacteria
VECTORS	animals, usually insects, which transfer disease
VENOMS	poisonous substances produced by reptiles, spiders and insects
VESICANTS	agents which cause blistering
VESICULAR	small fluid-filled sacs
VIRUSES	microorganisms requiring living cells for replication

ABBREVIATIONS AND ACRONYMS FOR CHAPTER 17

AC	hydrogen cyanide
BAL	British anti lewisite
BZ	3-quinuclidinyl benzoate
CAM	chemical agent monitor
CBR	chemical, biological, radiological
CG	phosgene
CK	cyanogen chloride
CL	chlorine
CN	mace
CS	tear gas
CX	phosgene oxime
DISPLAN	disaster plan
DM	diphenylaminearsine
DMAP	4-dimethylaminophenol
DNA	deoxyribonucleic acid
DP	diphosgene
GA	tabun
GB	sarin
GD	soman
GF	cyclohexyl sarin
Gy	Gray
HAZMAT	hazardous materials
HCl	hydrochloric acid
HD	sulphur mustard
HEPA	high efficiency particulate air
HN	nitrogen mustard
L	lewisite
LSD	d-lysergic acid diethylamide
PFIB	teflon
PPE	personal protective equipment
PS	chloropicrin
RNA	ribonucleic acid
Sv	Sievert
TRTS	triage revised trauma score
VX	–

CHAPTER 18

LEGAL, OCCUPATIONAL HEALTH AND SAFETY AND FINANCIAL ISSUES

LEGAL ASPECTS

1. A variety of laws apply to the medical management of disasters. These laws are in the form of both enacted legislation (which differs from State to State), and common law (ie cases determined by courts). Unlike other countries, there is no over-riding national legislation which is applicable in the event of a major disaster.

Legislation

2. Laws which can be seen to apply in disasters include the following;

- ***State Territory Emergency Management or Disaster Legislation***— Most States and Territories have specific legislation relating to Disasters. This legislation gives specific powers to designated individuals, such as State controllers.

- ***Professional Registration—***A number of professional bodies are regulated by State based legislation, which requires practitioners to be registered with medical or other boards. While there has been some movement towards mutual recognition of registration in other States, medical boards still require some form of registration for professionals who respond to disasters across State boundaries.

- ***Indemnity/Negligence—***The Commonwealth, States and Territories do not provide protection from claims of negligence against health care workers providing care in a disaster. Employees may be covered by the vicarious liability of their employer, where participation in disaster activities is included as part of their position description. Common law requires that health professionals act within the limits of 'reasonable care'. The common law requirements for consent also continue to apply.

- ***Public Health Legislation—***In actual (or potential) infectious disease outbreaks, public health legislation gives specific powers to Chief Health Officers.

- ***Occupational Health and Safety Legislation—***All States and Territories have legislation that requires employers to ensure that employees work in a safe environment. This continues to apply in a disaster, in both the prehospital and hospital environments, and includes aspects such as appropriate clothing and equipment, appropriate training, and appropriate management of psychological stresses. Occupational health and safety considerations are discussed in more detail below.

OCCUPATIONAL HEALTH AND SAFETY CONSIDERATIONS

Training

3. Wherever possible, disaster responders should have been trained to work in a disaster environment. This would include knowledge of safe lifting practices and patient handling, particularly in sites with uneven ground and debris. Wearing personal protective clothing and being aware of environmental hazards to which they may be exposed, are also necessary. Rapelling and other rescue techniques are specialised fields and should normally only be undertaken by health workers properly experienced in these activities.

Personal Protective Clothing

4. Personal protective clothing should be available for all members of medical teams. This is outlined in detail in Chapter Fifteen on Personal Equipment and Identification and includes the following:

- **Overalls** with padded knees/elbows (for prolonged kneeling).
- **Vests** with reflective tape to enhance visibility at night.
- **Footwear** to minimise ankle strains and foot crush injuries.
- **Latex gloves** should be present in ample quantity for staff dealing with blood and other body fluids. Sensitivity to Latex should be considered.
- **Leather gloves** to avoid cuts from glass and sheet iron.
- **Helmets** to protect from falling materials.
- **Eye wear (clear lenses)** to protect from dust, grit and body fluids.
- **Ear plugs** required for working in a noisy environment with cutting equipment and compressors.
- **Respiratory protection** against excessive dust or toxic fumes.

Other Protective Equipment

5. Sharps disposal containers should be available to minimise sharps injuries. Medical kits should utilise IV cannulae with self-retracting needles, IV lines with injection ports rather than bungs, and other recently available innovations which minimise the use of sharp needles in the field.

Substance Precautions

6. ***HIV/HBV Protection—***Blood and body substance precautions should be taken when dealing with all blood and body substances from all patients. 'Universal blood and body fluid precautions' were originally defined in the USA to cover blood and certain body fluids potentially infectious for human immunodeficiency

virus (HIV), Hepatitis B virus (HBV) and other blood borne pathogens. Barrier methods are recommended for dealing with fluids including:

- blood;
- any body fluids containing visible blood;
- semen;
- vaginal secretions;
- CSF;
- synovial fluid;
- pleural fluid;
- peritoneal fluid;
- pericardial fluid; and
- amniotic fluid.

7. ***General Protection***—However, even though the risk of transmission of HIV and HBV is low, it is also appropriate to use methods to protect from exposure to:

- faeces;
- nasal secretions;
- sputum;
- perspiration;
- tears;
- urine; and
- vomitus.

8. ***Basic Procedures***—Health care workers in a disaster should follow these basic principles:

- *Take care* to prevent injury with needles, scalpels and other sharp instruments during their preparation, use and disposal;
- *Protective barriers* should be used to prevent exposure to blood and body substances, (eg gloves, gowns, masks and protective ear wear). The type of barrier used should be appropriate for the procedure being performed; and
- *Cleaning* involving immediate and thorough washing of hands and other surfaces contaminated with blood or body fluids.

Disease Transmission

9. Where a disaster involves a widespread infectious illness (eg cholera or plague) additional special attention will need to be paid to mitigating transmission of disease. Some aspects of this are covered further in Chapter 10, Public Health—Response, in this Manual.

Environmental Control

10. Health staff should not be unduly exposed to toxic or other environmental hazards. They should normally only be employed in areas which have been cleared of hazards and deemed safe to work in by the combatting agency.

Personnel Movement Practices

11. Sensible personnel movement practices should be followed. Health personnel should be deployed in teams and their locations should be known. Individuals should not work alone or drive cars during bushfires or severe storms. Caution should be exercised where staff are required to trek or drive across rough or unknown terrain and persons with local knowledge should accompany them. Individuals working at night should be clearly identified and vehicles driven cautiously through areas where teams are deployed.

Unfamiliar Transport and Machinery

12. Specific safety measures are required when working in, and around helicopters, fixed wing aircraft and some types of machinery. Wherever possible, only personnel normally used to dealing with aircraft or machinery should work in close proximity. There are hazards associated with boats and other forms of transport. Where health responders are inexperienced, they should allow trained crews or emergency service staff to provide necessary transport.

Climatic Protection

13. Environmental control for workers would include protection from extremes of heat and cold where possible. Sunscreen should be used to prevent sunburn, and insect repellents available to protect from vectors of disease.

Briefing of Responders

14. Where possible a pre-deployment briefing should be provided for all health teams. This should give information on the general situation, the role of the responders and identified risks in working at the site. This might include warnings as to risks of falling debris from unsafe buildings, or dangers from fire or hazardous fumes.

Work Practices

15. Personnel should endeavour to follow normal safe working practices, seek advice and assistance when possible and not undertake rash or heroic deeds

when the task can be undertaken as effectively and more safely with other resources.

Health of Respondents

16. ***Suitability—***Personnel to work in a disaster setting should be adequately fit for the task and have no chronic medical problems influenced by extremes of heat or cold, long periods of heavy physical activity or lack of meals. Staff at risk should maintain immunisation against tetanus and hepatitis.

17. ***Working Conditions***—Staff should only be expected to work for reasonable duty periods and have relief provided at regular intervals. This will prevent fatigue causing errors of judgment. Adequate food, drinks and rest breaks will prevent dehydration, hypothermia or heat illness and exhaustion, which may substantially reduce the effectiveness of personnel.

18. ***Injuries to Personnel***—Any accident or health related incident occurring during a disaster, eg a sharps injury or back injury, should be reported promptly to the individual's employer or managing authority with full details of the date, time, location and circumstances. Where possible, records should be retained by the coordinating authority at a disaster to enable future follow-up.

19. ***Compensation Requirements***—It is expected that where health teams are deployed by an institution or agency to work in a disaster, then compensation for work-related injuries or illness will be the responsibility of the employer. The situation for self-employed individuals or other volunteers not employed by an organisation at the time is less clear and should be addressed during the planning process.

20. ***Follow-Up***—As well as operational de-briefings, psychological de-briefings should occur, and the responders' physical and mental well-being assessed. On-going health surveillance may be required.

FINANCIAL ASPECTS

Financial Administration

21. Costs incurred by providers of emergency care will be met from within existing budgets unless some other provision is made. States/Territories provide in their Emergency or Disaster legislation, for additional expenditure incurred following the implementation of that legislation. However, it should be remembered that these powers require formal declarations as provided in the legislation before having any effect.

PRINCIPLE
Health managers should ensure that some record is kept of the overall level of resources expended during a disaster (including overtime and consumables) so that cost recovery can occur.

Commonwealth Financial Responsibilities

22. ***Disaster Relief*—**The Commonwealth/State Agreement for financial relief under the Natural Disaster Relief Arrangements (NDRA) provides for special assistance if State/Territory outlays on disaster relief exceed a figure which is negotiated annually. Full details of the scheme appear in the booklet 'A Guide to the Natural Disaster Relief Arrangements', available from the Natural Resources and Energy Section, Department of Finance, Treasury Building, Newlands Street, Parkes, ACT 2600. Information contained in the booklet includes details of:

- administration;
- eligible measures;
- guidelines;
- funding; and
- expenditure

23. ***Disaster Response*—**The management of disasters or major incidents is a State/Territory responsibility. The Commonwealth, apart from maintaining a watching brief, will become involved and provide resources only following a direct request from the State/Territory. This request is usually made by the State/Territory emergency management organisation to Emergency Management Australia which, following Federal Ministerial approval, coordinates the provision of resources funded by the Commonwealth but only when State/Territory resources (including commercial) are fully committed.

REFERENCE

24. Reference used in this Chapter is as follows:

- Victorian Health Department: **Guidelines for the Control of Communicable Diseases**. Melbourne, Infectious Disease Unit, 1992, Pages 206–207.

CHAPTER 19

DOCUMENTATION

1. Documentation is one of the key aspects of all disaster management and commences with documenting the process which has taken place in readiness for any response to disaster, and continues through to the recording.

2. Whilst it is appreciated that documentation may not be seen as a high priority for a number of reasons during the response to a disaster, it must be completed accurately. This applies to any single or multi-casualty situation. Documentation within a disaster situation is essential for the continuity of a patient's physical care from the scene to discharge as well as the management of the welfare and psychological aspects of all those affected by the event, including loved ones. The documentation may be used by more than the medical services.

PRINCIPLE
Accurate documentation is essential in a disaster.

Rationale for Documentation

3. Documentation is required to support **patient physical and psychological care, medico-legal** aspects, **planning** and **research**.

TRIAGE TAGS

4. Initial patient documentation at the scene is facilitated by the use of coloured, numbered triage tags. Although the precise layout of the tags varies, certain principles apply. Triage Tags are numbered, which assists with the identification of unconscious patients and coloured for ease of prioritisation of patient movement. In general the following colour codes are used:

- **Red** – urgent.
- **Orange/Yellow** – delayed.
- **Green** – routine.
- **Black/white**—deceased.

5. All Triage Tags should allow for the recording of clinical assessment and field treatment provided. The colour coding can be changed as patients' conditions change. Triage Tags form the initial medical record and must not be removed until admission to hospital or area of definitive care. The tag must then be incorporated into the medical record. The black and white tag acts as a certification of life extinct and should be completed legibly by a Medical Officer. The removal of the deceased is a Police responsibility. An example of a Triage Tag is shown at Annex A to this Chapter.

PATIENT CARE

Patient Movement/Registration Form

6. It is essential that a record is made of the patients that have been formally transported from the incident site to a further treatment area. This documentation should be shared with the Police as a means of commencing the identification/re-uniting process.

7. This record should include such detail as:

- age and sex of patient;
- patient name or identification detail;
- the mode of transport from the scene;
- transporting crew detail;
- the destination of the patient;
- the triage label number; and
- the triage label colour.

Medico-Legal

8. Medico-legal requirements within a disaster response encompass the recording of actions taken, patient details, treatment provided and personnel involved in the response. With this in mind there must be sufficient documentation that will provide for all aspects of the medical response. Logs must be maintained at the site and at control centres that reflect the staff on duty both at the scene, and in any control centres, what they were doing, where they were and when they were relieved. Any injuries to staff and treatment given should also be documented. These logs should also identify changes of command and the time of any occurrence. The setting up of these logs is the responsibility of the Medical and Ambulance Commanders both in the field and any control centres.

OTHER DOCUMENTATION

Ambulance Officer Patient Report Form

9. Ambulance Officer patient report forms provide vital observations of a patient and the care provided and should be completed with as much detail as possible without creating any delay in the turn around time of the ambulance. This form is to be included within the patient's hospital medical record.

Hospital Documents

10. Hospitals should have prepared a quantity of disaster documentation to assist with rapid registration and processing of disaster casualties.

QUALITY MANAGEMENT

11. Accurate documentation will permit auditing that will assist in the on-going development of programs associated with elements of disaster management; namely: Prevention, Preparedness, Response and Recovery. Inherent in this program is the expectation that appropriate documentation will be used to assist with operational debriefing and plan modification. It is from these reports that the development of preventative measures can occur in the design and engineering arenas.

CORONIAL ASPECTS

12. After any disaster or major incident, including human death, there may be Coronial investigations as to the cause, results and actions taken during the event. It is therefore essential to ensure that documentation is completed to the best of one's ability, even under extreme circumstances.

RESEARCH

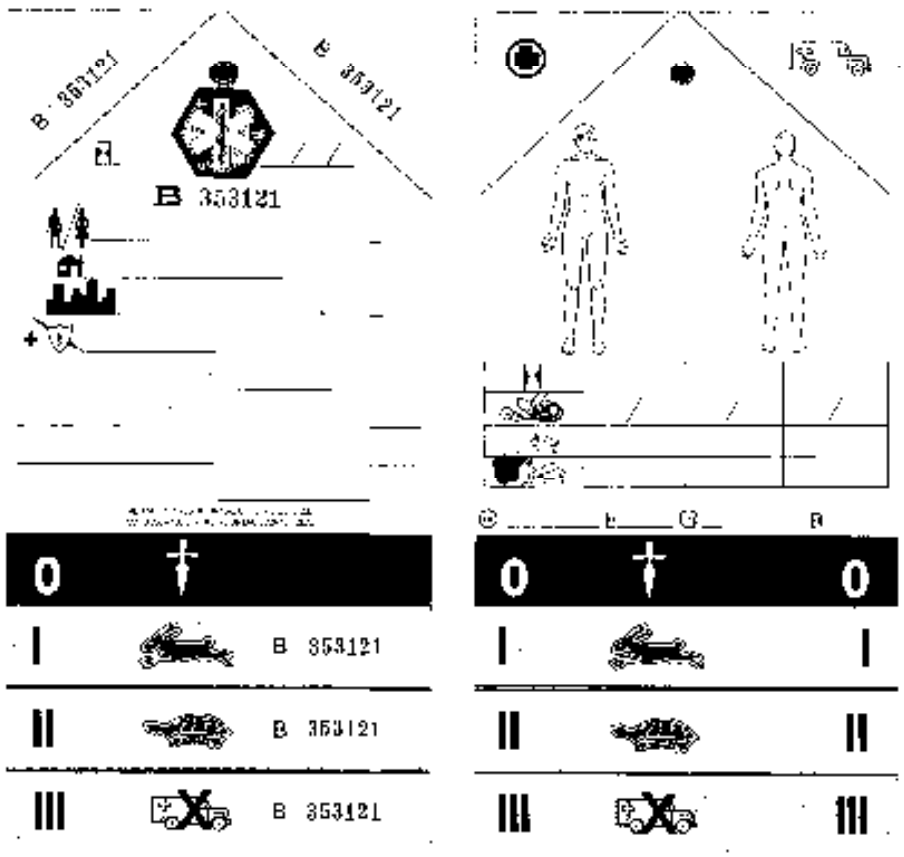
13. Documentation should be collated and stored in a manner that will permit the establishment of a data base that can be used for subsequent research either in your own facility or other associated medical areas.

PRINCIPLE
Your documentation may better prepare the next responder.

SUMMARY

14. Accurate documentation is essential to provide for an efficient and effective response, good patient management and care, medico-legal purposes and research in preparation for the planning.

EXAMPLE OF A TRIAGE TAG



CHAPTER 20

TRAINING AND EXERCISES

INTRODUCTION

1. To provide optimal care for the disaster victims the health professional requires clinical judgment skills in acute medicine, together with familiarity with the arrangements and plans for such a disaster. Personal attributes include good health, common sense, enthusiasm, decision-making abilities, a degree of flexibility, and the ability to work within a team.

Aim

2. The aim of disaster medical training is to provide the participants with the knowledge and skills that will permit the greatest good for the greater number.

Disaster Medicine

3. Mass casualty care involves rationing. By definition, disasters are events that overwhelm the resources immediately available. Training must equip the individuals and teams to integrate medical principles with the limitations that the disaster imposes. The training can be provided as individual skill acquisition or collective group training. It is not every health worker who wishes to work in the pre-hospital environment. It is essential that personnel identified as emergency responders are physically and psychologically prepared for such activities, and have completed appropriate training.

Policy Considerations

4. Training must be compatible with, and give support to disaster plans. Responsibility for training must be clearly defined.

Disaster Management Education

5. Education is required in the wider aspects of disaster management, in order to equip responders for specialist disaster-related tasks, and to orientate their actions within the overall management of the crisis.

6. Training for disaster management requirements need not be a complicated and expensive exercise requiring specialised facilities and equipment.

7. An astute balance between existing training opportunities and specialised personnel will meet initial requirements and form the basis for future development.

Skills Training

8. Training is required for those personnel who may be needed to perform specific skills in unusual circumstances. Examples include:

- clinical assessment;
- triage;
- interventions;
- patient evaluation;
- documentation;
- communications; and
- public health.

TRAINING MANAGEMENT (GENERAL CONSIDERATIONS)

9. Before establishing and implementing training, it is prudent to identify and consider specific factors, which affect overall training. These may include the following:

- The basic organisation applying to disaster management within the state or country, as this will influence training. It may also provide a suitable training structure or framework.
- The current status of disaster management because this has a bearing on the scope of training programs.
- The degree to which the disaster management system, Prevention, Preparedness, Response and Recovery, is utilised. This will reflect existing up-to-date experience and help to identify types of training needed.
- The experience and knowledge of trainers.
- The commitment of management to fund training.
- The resources which are available to implement training programs, staff, accommodation, teaching aids and administrative support.

10. In summary the planning process for training addresses the key elements of:

- **what** is to be learnt;
- **how** is it to be learnt; and
- **how** learning is to be assessed

Skills Acquisition and Maintenance

11. Training without practice is a wasted activity. Clinical skills such as cannulation must be continually practiced to maintain proficiency and should be linked where possible to skills performed in day to day clinical practice. When disaster strikes the time for training is well past.

Coordination Training

12. Training in agency coordination and comprehensive disaster management is required for key personnel from:

- medical and nursing personnel;
- ambulance services;
- hospitals;
- community health;
- public and environmental health agencies;
- mental health services; and
- voluntary organisations.

Where possible this training should include personnel from other services to add to the reality of a multi-service response.

13. As an adjunct to this training, the services and the organisations themselves need periodic practice and evaluation in a coordinated response, usually in the form of combined exercises.

Specialised Training

14. Training, often by means of workshops or seminars, to cover:

- specialised threats (hazardous chemicals); and
- specialised events (mass crowd events).

Validation of Training

15. All training must be evaluated. The total effect of training both short and long term should be then validated for both its effectiveness and efficiency. Validation identifies changes which must be made to keep training both efficient and effective, as indicated below.

Efficiency

16. Training is efficient when a satisfactory number and proportion of trainees meet the requirements of the training objectives for the least cost.

Effectiveness

17. Training is effective when it prepares the trainees to perform to the desired standard. Further information can be found in the Australian Emergency Manual—Small Group Training Management. (*See* References information at end of Chapter)

TRAINING EXERCISES

Introduction

18. Training exercises provide probably the best methods of validating disaster/major incident plans, apart from the real event occurring. They should be conducted to reinforce and test a training program. It is essential that realistic exercise objectives be established which are consistent with the training objectives to be tested.

19. The three components required in exercise objectives are:

- **performance** required from participating individual/teams;
- **conditions** under which this performance will be tested; and
- performance **standards** to be achieved.

20. There are several different types of exercises which can be conducted (eg **Oprex**—operation exercise where personnel are deployed; **Discex**—a discussion exercise where representatives verbally present their Department or Service response to a given scenario; and **Papex**—paper exercises where control room staff respond to control notes, input by directing staff).

21. Where a training exercise is to be conducted it is important that proper preparatory work and documentation is carried out to ensure the maximum value is gained from your efforts. It is also recommended that other functional services such as police, fire and ambulance, as necessary to your scenario, are involved in the planning and actual exercising to ensure more accurate detail is provided.

Exercise Planning

22. The first step in preparing any exercise is to analyze the need and give thought as to who would benefit by being involved as a participant.

Policy

23. Having established the need for an exercise and identified appropriate participants, convene a policy meeting involving representatives from the services and/or Departments. Decisions are then made on:

- the type, nature and scope of the exercise that can be conducted which would best satisfy the training needs of all participants;
- the organisations that need to be involved for maximum benefit;
- policy directives to which the writing team must adhere;
- the aims and objectives of the exercise;
- the financial constraints if any;
- the method of evaluation;
- writing team nominations preferably with a cross-section of the services to be involved;
- the need to alert the general public to any inconvenience or to allay any fears and the means by which this can be conveyed;
- any potential industrial implications; and
- the involvement of the media.

Detailed Plan

24. It is now the job of the writing team to meet, and plan the finer details such as:

- the date, time and duration of the exercise;
- the location of the exercise;
- the appointment of key coordinating/directing staff for the exercise who will be responsible for:
  - liaison with visitors and the media;
  - site security and control;
  - safety and damage control; and
  - filming, photographing or recording of the exercise;
- preparation or distribution of all the documentation; a ‘time line’ for the preparation, conduct and debrief of the exercise;
- the types of props and special effects that will be needed and where they can be obtained;
- the number of ‘casualties’ that will be needed and where they can be sourced;

- the capability to moulage the casualties;
- the provision of exercise support such as vehicles, radios, toilets, catering, shelter;
- obtaining observers to critique various facets of the exercises; and
- organising further progress meetings. (An Exercise Planning Model appears at Annex A to this Chapter.)

Post-Exercise Activities

25. On completion of any exercise a debriefing must occur and a report prepared and distributed to participants and any organisations with a particular interest in the scenario.

26. The report will provide a platform for the review of plans and procedures which should now be carried out together with any necessary remedial staff training.

27. Finally, letters of appreciation need to be forwarded to those persons or organisations that have provided some logistical support to your exercise.

SUMMARY

28. Education and training are essential components of competent disaster medicine preparedness.

29. Before implementing training, it is important to recognise the wider aspects of disaster management, and ensure such training activities are compatible with the overall management of the envisaged crisis.

30. Training exercises are the best way of validating disaster/major incidents, short of the real situation.

REFERENCES

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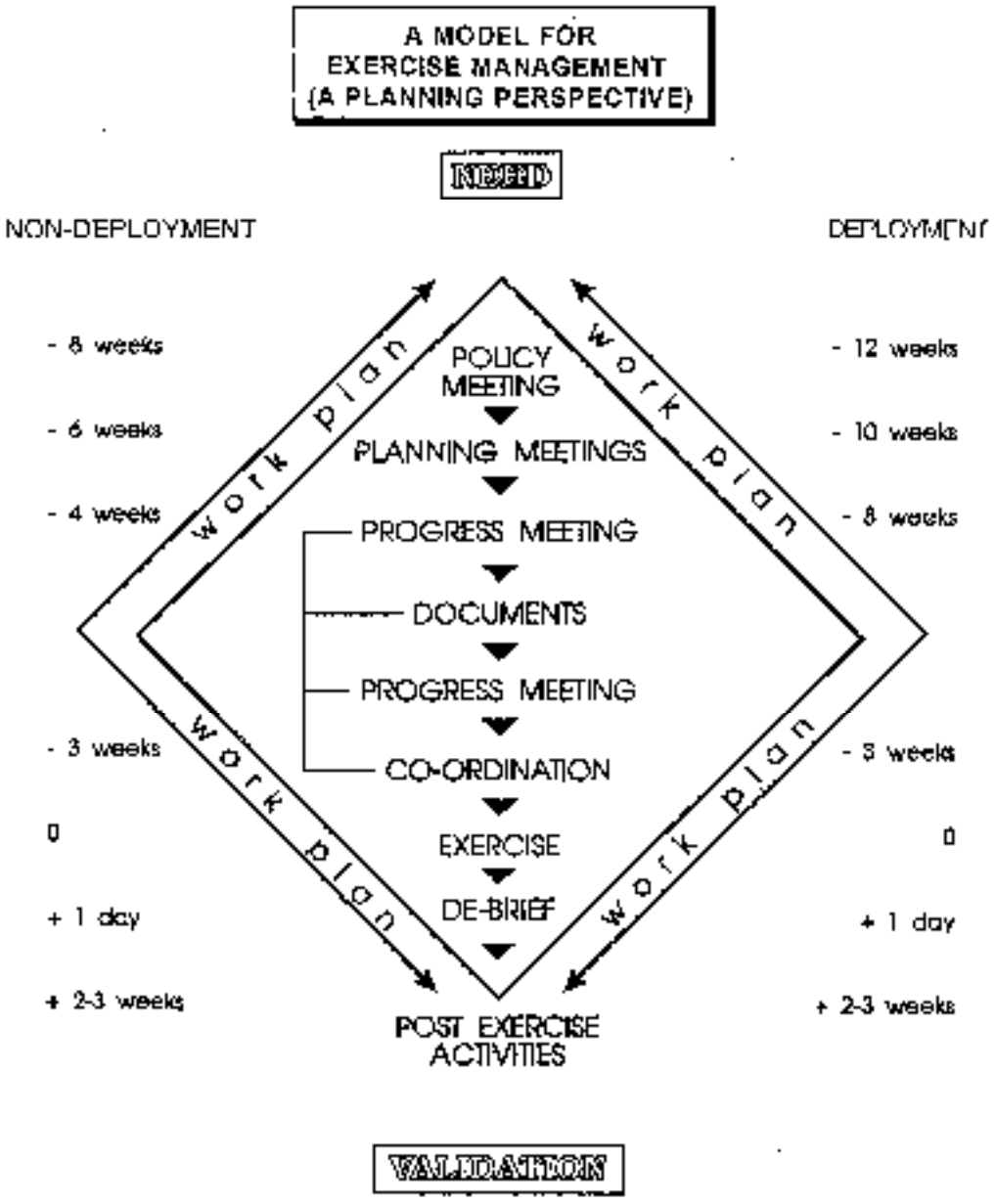
- South Australian Central Exercise Writing Team Report. 1985

Annex:
A. Exercise Planning Model

EXERCISE PLANNING MODEL



CHAPTER 21

CULTURAL AND SPECIAL NEEDS CONSIDERATIONS

INTRODUCTION

1. Australia is a multi-cultural society. Therefore, there is likely to be a wide diversity of cultural and ethnic backgrounds, which will have to be considered in a disaster situation.

PRINCIPLE
Consider the cultural and ethnic aspects in all situations.

CULTURAL REQUIREMENTS

2. In the early stages of the response it may need to be determined if there is a likelihood for special requirements of those involved (including the responders) and consideration will need to be given to:

- language;
- food requirements;
- animosity between ethnic groups and a need for security measures;
- special requirements of the aged ethnic person; and
- religion/customs.

3. The utilisation of key ethnic community leaders and tribal elders must always be considered, to convey information and minimise issues, which might impact on a particular ethnic or tribal group.

SKILLS DEVELOPMENT

Key Skills

4. Emergency health workers will need to develop skills to communicate across:

- cultures; and
- languages.

5. These two requirements are important pre-requisites for the key elements in effective disaster management. They are applicable to all four elements of disaster management, namely prevention, preparedness, response, and recovery. It is important for emergency health workers to realise that people from different ethnic and cultural backgrounds will, in a disaster, display culturally determined behaviour that could be well outside the Anglo-Saxon norm, and which, unless understood, could be quite bewildering to the

emergency health worker. Misunderstanding or misinterpretation of behaviour may easily hamper service delivery.

Planning and Training

6. The essence of being able to respond to cultural needs in a disaster is forward planning, and organisations planning for emergency situations must incorporate a segment on cross-cultural communication in training courses. This may be achieved in the following ways:

- ***Interpreters***—An up-to-date list of interpreters with 24 hours contact numbers must be maintained. These interpreters must be aware of their role and the chain of command in a disaster.
- ***Recruitment of Bilingual Staff***—conscious efforts should be made to recruit staff from ethnic minorities.
- ***Multi-Lingual Cards***—Such cards can be used to establish the language a person speaks so that an appropriate interpreter/staff member can be called. Such cards can also be used in the translation of various important messages such as evacuation and emergency instructions.
- ***Ethnic Structures***—In any community that has ethnic minorities there will be ethnic welfare organisations, which may be origin or religion, based. Emergency service organisations must have a knowledge of these welfare organisations and maintain links with them and ensure that they are consulted and involved in the counter disaster planning process.
- ***Other Professionals***—Lists of chaplains, and health professionals who have a knowledge of their community should be maintained. Where possible such persons should be actively involved in training for the emergency situation.
- ***Other Considerations:***
  - Members of the same ethnic group do not always share the similar thoughts, points of view, interests, orientation, culture, dialects, education, religion and political orientation.
  - Ethnic groups may be randomly scattered throughout the area.
  - As in any society, members of a given ethnic group tend to gather in certain areas.
  - In an emergency, isolated people, such as women with small children and the elderly, are the most vulnerable of the group.
  - Ethnic members may go to alternative places for help, instead of established aid agencies.
  - Ethnic groups may use non-verbal means of communication unfamiliar to you. They may also misunderstand your non verbal methods of communication.
  - Ethnic people may be a reliable vehicle to convey emergency preparedness and response information.
  - Where appropriate children may serve as translators for parents and the elderly.
  - Customise emergency programs for ethnic groups within your community.

OTHER SPECIAL NEEDS

Disability

7. An emergency creates challenges for both the able-bodied and disabled individuals. For example, sighted individuals become visually impaired when a room fills with smoke. Some disabled people will need very little support in an emergency situation whilst others will obviously require a great deal of help.

8. The task of an emergency manager is to ensure that the critical emergency needs of the community, the able-bodied as well as those with special needs, are met. Working with the disabled, involving them in this vital community process will result in a higher degree of preparedness for the entire community. Two key questions follow:

- Are disabled people included in the community preparedness exercises and how can they assist in an emergency?
- Do they and the community know what to expect in an emergency?

9. Some considerations for dealing with disabled persons during a disaster are:

- always look at the person not the disability;
- never make assumptions about a person's need. Ask the person concerned not a third party;
- when communicating with people with speech impairments, give them time, concentrate on what is being said and listen to their rhythms of speech and don't be afraid to ask for something to be repeated;
- when communicating with people with a hearing impairment, face them and ask them if they lip-read. If so talk slowly and clearly and avoid covering your mouth;
- when communicating with a person through an interpreter or facilitator—whether for reasons of hearing impairment or other communication needs—always address the person not the interpreter or the facilitator;
- when talking to someone who is using a wheelchair try to ensure that your eye levels correspond;
- when guiding a blind person try not to push or pull them—ask if they wish to take hold of you, and warn of any hazards as they occur; and
- remember no two people have identical needs.

Dietary

10. Special dietary needs of the community should also be considered including;

- the elderly;
- infants;
- pregnant women;
- cultural needs; and

- other special diets (eg diabetic, gluten intolerance, medically prescribed).

Medical Requirements

11. Special medical needs should be considered including medication and physical requirements such as dialysis.

SUMMARY

12. Cultural and Special needs must be included in the planning and preparedness phases.

13. Emergency workers must be aware of and give due consideration to cultural and special needs during the response.

14. Seek out key community leaders to assist in developing and implementing appropriate cultural and special needs strategies.

REFERENCES

15. References used in this Chapter are as follows:

- Adamson. R. **Disabled and Disasters**. ***Emergency Preparedness Digest*** Volume 23(4), October–December, 15–17, 1996.
- Duguay. J. **Safe in any Language**. ***Emergency Preparedness Digest*** Volume 23(4), October–December, 12–14, 1996.
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CHAPTER 23

PUBLIC RELATIONS

INTRODUCTION

1. Good public relations are essential at all times in all organisations by all personnel for them to be successful. During disasters the provision of public relations differs only by the demands and the magnitude of the requirement. Hopefully, the knowledge that planning has been approached fully, and preparation has been made, will enable the organisation to cope. Criticism may well follow the failure of health authorities to pay due attention to this often neglected part of disaster planning.

2. With the major concern being to provide the best possible medical care for the injured, it is easy to overlook the psychological needs of relatives and friends, to ignore or not be prepared for the offers made by volunteers, and to antagonise the media by failing to provide accurate information. All managers in all organisations must be aware of their public relations responsibilities and also the window of opportunity that the disaster may provide.

PRINCIPLE
Public Relations should be the opening of a window of opportunity.

RECEPTION OF RELATIVES

Relatives' Reception Area

3. In many disasters, a large number of people arrive at the hospital, including uninjured disaster victims, who may not only have lost their means of transport or belongings, but are looking for friends or relations who may have been injured. This particularly occurs in a local community disaster. This group of people must be provided for by identifying a formal relatives' reception area away from the treatment areas, where they can be courteously but firmly directed to. Without such area formally identified, these people will continue to remain a problem in treatment areas.

4. The area should have been identified during the planning process, and have facilities which will enable not only the dissemination of the names of the deceased and injured, but provide for the commencement of counselling and the registration of the location of relatives. It must be equipped with the usual essential amenities. It is also an area where good use can be made of appropriate volunteers.

Casualty Lists

5. To the person in charge of the relatives' reception area falls the responsibility of dealing with distraught men and women desperately seeking information. Every attempt must be made to ensure that the information given to individuals is

correct. Copies of the casualty list received from the information centre may be displayed on a board but clinical details or status should not be included.

Releasing Patients

6. A number of casualties with minor injuries will be able to leave the hospital once they have been registered and received treatment. They should also be directed to the relatives' reception area either to meet up with friends or relatives, or to be assisted with their accommodation or travel arrangements.

Identification

7. Identification of unconscious or deceased casualties is carried out with the assistance of the police.

VOLUNTEER MANAGEMENT

8. During a disaster many people come to a receiving hospital offering their services in a number of roles. Turning them away will cause offence and possibly adverse publicity.

Planning

9. Community organisations and groups can play an important support role during disasters and should be involved in disaster planning processes. During this process it should be identified where volunteers can register for service during a disaster and this should preferably be away from a hospital.

Reception and Deployment

10. All volunteers coming to a hospital should be received by the 'reception officer' who registers, identifies and deploys them. Registration is important as it not only allows the volunteers' services to be acknowledged subsequently, but enables any purported qualifications (particularly medical and nursing) to be checked, and provides validation in the event of any claims for compensation.

PRINCIPLE
Only take as many volunteers as you can properly supervise

VERY IMPORTANT PERSONS

11. All disasters produce VIPs who are likely to want to visit the disaster site or receiving hospitals for a variety of motives. Local dignitaries, politicians, government and state officers, heads of state and royalty may wish to meet survivors, emergency services and hospital staff. Usually these visits are arranged with due consideration for work in progress and, depending on the status of the visitor, an appropriate escort should be provided.

SUMMARY

12. Good public relations are essential at all times in all organisations to ensure a successful outcome.

13. All disasters are public relations events, and criticism may well follow the failure of health authorities to pay due attention to this often neglected part of disaster planning.

14. The importance of sound management of volunteers should not be overlooked.

REFERENCES

15. References used in this Chapter are as follows:

- Auf Der Heide, Erik.: **Disaster Response: Principles of Preparation and Coordination**. St Louis: CV Mosby, 1989, ISBN 0 8016 0385 4.
- Baskett, Peter J.F. and Weller, Robin M.: **Medicine for Disasters**. ISBN 0 7236 0949 7.
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CHAPTER 24

MEDIA

MANAGING THE MEDIA

1. Disasters are a significant source of news. Studies estimate that 25 per cent of all news stories involve disasters, hazards, or civil disturbances.

Developed World

2. In the developed world, where technological disasters predominate, modern communications allow representatives of the media to become rapidly aware of any incident involving injury or loss of life. Very often newspaper, radio and television reporters arrive at the disaster site and receiving hospitals at the same time as the emergency services. Modern telecommunication networks allow radio and television programs to be interrupted for news flashes about any significant incident, and television pictures are often seen globally within a few hours, in some cases direct from the site.

Developing World

3. In the developing world, local media representatives are often able to give vivid descriptions of the disaster. When the event is of sufficient size or significance to attract the attention of the world press and television, the disaster site and local health facilities may be invaded by journalists and camera crews from many countries.

4. We are therefore aware that the media representatives will be requesting information about emergencies and disasters and that, if they are not properly provided for, they can cause problems for responding personnel. It is recommended that health care agencies and facilities prepare for this eventuality by developing a media policy, nominating media liaison personnel and providing relevant training for their personnel.

VALUE OF THE MEDIA

Benefits

5. Given access to accurate intelligence, the media can be an important distributor of information about disasters. It can provide invaluable information about the probability of disasters, and steps that individuals can take to maximise their survival. The presentation of such information in a way that provokes attention is a special skill. In the aftermath of disaster, one of the main functions of the media can be to provide the affected community with information about the post disaster assistance. As well, a range of information can be given about the health and psychological affects of disaster, which assists in the long term rehabilitation of the community. In summary these include:

- warning of impending disasters;
- alerting of response personnel;
- providing instructions on ways to minimise the affects of the disaster;
- advising on the psycho-social affects of disaster;
- acting as a medium for urgent communication;
- to direct enquiries to the appropriate agencies; and
- to stimulate and direct appropriate donations from elsewhere to support the victims of the disaster.

Media Relations

6. Emergency managers have often expressed frustration with media operations in disaster. They feel that the media complicates the tasks at hand and diverts attention from urgent matters like casualty care, search and rescue and evaluation.

7. Another contention is that the media is pre-occupied with the dramatic aspects and often accentuates the destructive magnitude of disasters. Nevertheless, advances in communications technology have enabled media convergence at disasters. Therefore, it is important to maintain a pro-active relationship with all media representatives, to enable the many positive aspects of their activities, outlined earlier, to be achieved. A media liaison officer must be appointed to coordinate media responses.

PRINCIPLE
The media is important in the dissemination of information. The maintenance of a pro-active relationship is essential.

MUTUAL COOPERATION AND PLANNING

8. Responsible members of the media should be encouraged to integrate the media's role into disaster planning activities.

9. It is also important in the planning stage to establish good links between the various media liaison officers, appointed within the health and medical arena, as well as the Police and Emergency Services. The credibility of each organisation involved in any joint response is enhanced, if a balanced report is being provided, with each agency media liaison officer providing the information from his/her organisation's perspective.

10. This planning in liaison will also assist to address situations where the Police or another agency has a need to restrict or control the information released to the media.

11. Owing to the nature of work provided by the ambulance services, they provide almost a daily 'meal' to the media, and normally have fostered very good relationships with the media.

PRINCIPLE
Adequate disaster preparedness requires planning WITH the media rather than FOR the media.

Media Liaison

12. Members of the media have been trained to report the unique and sensational and two main criteria are applied. The most important is its impact in terms of deaths and injuries; the second is the extent of property damage. Reporters will want to interview participants in the response, officials in charge of disaster operations, witnesses, and victims. Issues that may be raised include the following:

- ***Casualty Information:***
  - How many were killed or injured?
  - Of those injured, how serious is their condition?
  - How many uninjured?
  - Were any of the victims prominent persons?
  - How were the injured managed?
  - Where were they taken?
  - What was the disposition of the dead?
- ***Health and Social Issues:***
  - How many homes were damaged?
  - How many displaced persons are there?
  - What are the shelter arrangements?
  - What are the health risks associated with:
    * food;
    * water;

    * sanitation; and
    * infectious diseases?

- ***Health Facilities Damage:***
  - What kind of structures are involved?
  - Did the damage include any particularly important property, facilities or units?
  - What measures have been undertaken or are being undertaken to protect patients?
- ***Response and Relief Activities:***
  - Who activated the health response?
  - Who is in charge?
  - How quickly were response units on the scene?
  - What agencies responded?
  - How many are engaged in the response?
- ***Other Characteristics of the Crisis:***
  - Were there any specific difficulties?
  - Any problems with infection or contamination?
  - Are people still trapped?
  - What were the resulting affects (eg anxiety, stress) on the families and survivors?

PRINCIPLE
Many of the questions that will be asked by reporters are predictable, so procedures can be established in advance for collecting and providing the desired information.

Disaster Site Access

13. Unauthorised media should not access the disaster site and, instead, should receive information from a responsible authority through a Media Liaison Centre. The media should be given facts, not unsubstantiated opinions or speculation. It should be accepted though that the media have a job to do, and if a controlled or limited visit to the site is promoted, to enable pictures or footage to be taken, even on a pre-arranged shared basis, this effort will be appreciated.

14. There are also times when the lighting equipment carried by the media may assist the responding ambulance and medical personnel.

News Conferences

15. For all types of media, the most important sources of news are official agencies, and much of the news about disasters tends to be reported from the perspective of these agencies. In fact, the media can be depended upon to

demand news conferences at which an authoritative official statement can be recorded.

Conference Guidelines

16. Should health officials be required to participate in a conference it is suggested that the designated persons should follow these guidlelines:

- *Be prepared*—Certain questions are predictable—be ready with the right answers.
- *Be wary of the 'off the record' comments*—It is safer to assume that anything 'off the record' might be published.
- *Be honest*—Trying to cover up mistakes, mislead the media, or withhold critical information about a disaster can backfire.
- *Manage ambiguity*—Accurate information is often not available. State this simply and avoid speculative answers.
- *Relate to the audience*—Remember that you are not talking to an audience of fellow experts.
- *Avoid using technical terminology and jargon*—Be human, avoid 'talking down' to the audience, yet maintain a professional demeanour.
- *Take the initiative*—The interviewee is chosen because he or she is the expert. As such, he or she is in the best position to judge what are the important issues. The interviewee should take the lead in pointing this out and directing the course of discussion. Ask that a question be rephrased if what is being asked is not clear .....'Did you mean .....?'.

At the Hospital

17. A procedure to cover the response to the media should be included in hospital disaster plans. Each hospital will have a recognised senior member of the administrative staff who liaises regularly with media.

18. When a large number of casualties are involved, or where figures of national or international importance or notoriety are injured, it may be wise to designate a suitably trained senior member of the staff for media liaison, supported by the media liaison officer.

19. In dealing with the media at the hospital it is important to identify hospital representatives; designate a suitably equipped media room; effect liaison with other involved agencies eg police, fire, ambulance; quickly provide a source of reliable information and ensure a system for regular releases and updating of information.

Requests for Information

20. Where immediate details are not known in answer to specific questions, the queries should be noted for response at the next press conference together with details of when and where the next briefing will be provided.

MEDIA RELEASES

21. A sample of a suitable hospital first media release appears as Annex A to this Chapter.

SUMMARY

22. The portability of communications equipment and mobility of the media representatives will enable them to broadcast from an incident site almost as quickly as the emergency services can respond, therefore we must prepare for their involvement and turn their presence to our advantage.

23. Benefits can be gained by involving media in the planning stages, as they best know how they can help.

24. The preparation of an aide memoir for the media liaison officer during the planning stages may ease the pressure during the event.

25. The media has a job to do and we should acknowledge this by turning their responsibilities to our advantage.

REFERENCES

26. References used in this Chapter are as follows:

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Annex:
A. Hospital First Media Release Format and Ambulance First Media Release

HOSPITAL FIRST MEDIA RELEASE FORMAT AND AMBULANCE FIRST MEDIA RELEASE

HOSPITAL–FIRST MEDIA RELEASE FORMAT

. . . . . .
Hospital
. . . . . (date) . . . . . (time)
Casualties have been received at the . . . .
hospital of whom . . . . have been admitted. . . . . casualties
are seriously ill/injured and are undergoing emergency surgery/care. . . . . casualties are being treated for minor injuries, most of whom are likely to be discharged. The emergency work of the hospital is being co-ordinated by
. . . .
. . . ..
A further press statement will be released at . . . . . am/pm.
. . . . . signed Media Officer

AMBULANCE–FIRST MEDIA RELEASE FORMAT

. . . . . Ambulance Service
at . . . . . (time) near . . . . (location) . . ..
persons were injured as a result of . . . . . .
. . . . . (brief incident description). The ambulance service response included . . . .
. . . .
(paramedic/rescue response). The medical response included . . . . . .
.
(health and medical response). Other agencies involved included . . . . . .
. . . . . (Fire, EPA, Rescue).
Casualties were transported to . . . . . hospital(s).
A further media release / press conference will be at . . . . am/pm at . . . . . .
. . . . . on . . . . . (date)
Further information can be obtained from . . . . (name)
. . . . . Phone number . . . . . Fax number
. . . . . E-mail address

SECTION 1

OVERVIEW OF DISASTER MEDICINE

SECTION 2

DISASTER MANAGEMENT AND PLANNING

SECTION 3

DISASTER MANAGEMENT PRACTICE

SECTION 4

DISASTER MEDICINE RESOURCES

SECTION 5

DISASTER MEDICINE—OTHER CONSIDERATIONS

SECTION 6

SUPPORTING INFORMATION

GLOSSARY

Absorbed Dose The energy that is deposited by radiation in any material. (see table following this Glossary)

Activity In terms of radiation measurement, the activity of a radioactive material refers to its rate of radioactive transformation or decay. (see table following this Glossary)

AIRAC Australian Ionising Radiation Advisory Council.

ANSTO Australian Nuclear Science and Technology Organisation (prior to 27 April 1987, the Australian Atomic Energy Commission).

ARL Australian Radiation Laboratory.

Arming As applied to explosives and weapons, the changing from a safe condition to a state of readiness for initiation.

ASROC Anti-submarine rocket launched from surface ships, and capable of carrying either a nuclear or conventional warhead.

Attack Class Submarines Submarines whose primary mission is that of attacking other ships. US submarines in this category are generally capable of deploying theatre nuclear weapons.

Ballistic Missile Submarines Submarines armed with inter-continental ballistic missiles. Submarines of this type do not visit Australia.

Becquerel The unit in the international system of measurements for measuring the activity of a radioactive source. (see table following this Glossary)

Biological Shielding Material placed around a nuclear reactor to protect operating personnel and others from exposure to radiation in excess of permitted levels.

Cladding A thin layer of metal totally enclosing nuclear fuel which protects the fuel from chemical attack (corrosion) by the coolant, prevents the escape of fission products, and provides structural support.

Containment A structure which completely surrounds the reactor system and is designed to contain the releases from accidents with little or no significant release to the environment.

Control Rod A solid element that absorbs neutrons and hence, when inserted into the reactor core, decreases reactivity, producing a decrease or shut-down in power production. Control rods are used for reactor control.

Coolant In a pressurised water reactor, the water passed through the core of a reactor to remove the heat liberated in the fission process. The coolant may also be referred to as the primary coolant.

Core See 'Reactor Core'.

Core Melt The term applied to the overheating of a reactor core as a result of the failure of reactor cooling systems, leading to melting of the fuel and the structures which hold it in place. Also called 'meltdown'.

Critical Just capable of sustaining (at a constant level) a chain reaction. A nuclear reactor is critical when the rate of neutron production is equal to the rate of neutron loss. A reactor is said to be subcritical when it can no longer sustain a chain reaction and supercritical when it is more than capable of sustaining such a reaction.

Critical Mass The least mass of fissionable material that will permit a self-sustaining chain reaction.

Curie The traditional unit for measuring the activity of a radioactive source, now being replaced by the Becquerel. (see table following this Glossary)

Decay Heat The heat produced by radioactive decay of fission products in the reactor's fuel.

Dose (of Radiation) Amount of energy delivered to a unit mass of a material by radiation travelling through it.

Dose Equivalent The absorbed dose multiplied by a modifying factor that reflects the fact that different kinds of radiation having the same amount of energy per unit mass have different biological effects. For example, one gray of alpha radiation can cause about twenty times the biological damage caused by one gray of gamma radiation. By use of dose equivalents, the effects of absorbed doses of different types of radiation can be added together. (see table following this Glossary)

Emergency Core Cooling System (ECCS) A separate cooling system designed to maintain core cooling in a shutdown reactor, following an accident that has disabled the normal coolant system.

Emergency Reference Level (ERL) A level of exposure to radiation which regulatory authorities recommend should not be exceeded in an emergency, and which serves as a guide to when emergency protective measures should be taken

Enriched Uranium Uranium in which the proportion of the fissile isotope uranium-235 has been increased above its natural level of 0.7%.

Fission The breaking of a nucleus into two lighter fragments (known as fission products) plus free neutrons - either spontaneously or as a result of absorbing a neutron.

Fission Products Nuclides produced directly by nuclear fission or by the subsequent radioactive decay of such nuclides.

Fuel Element The smallest individual unit of a reactor core containing nuclear fuel as its principal constituent.

Gamma Radiation High energy radiation of considerable penetrating power emitted by some radioactive substances.

General Accounting Office An agency created by the United States Congress to monitor government expenditure and to review government programs. It is an approximate equivalent to the Australian Auditor-General's Office.

Gray The unit in the international system of measurements for measuring the energy that is deposited by radiation in any material (ie. the absorbed dose). (see table following this Glossary)

Half Life (Radioactive) The time taken for the activity of a radioactive material to lose half its value by radioactive decay.

Insensitive High Explosive (IHE) As defined by the US Department of Energy, explosive substances which, although mass detonating, are so insensitive that there is negligible probability of accidental initiation or transition from burning to detonation. IHE is used for the explosive trigger in most US nuclear weapons developed since the late 1970's.

Iodine A non-metallic element. In radioactive forms it is one of the radionuclides that may be released from the reactor core in a reactor accident.

Ionising Radiation Any radiation that directly or indirectly displaces electrons from the outer domains of atoms.

Isotopes Nuclides having the same number of protons in their nuclei, and hence belonging to the same chemical element, but differing in the number of neutrons. Such atoms have identical chemical properties but their nuclear characteristics, e.g. neutron absorption or fissile properties, may be vastly different (as, for example, the isotopes of uranium U-235 and U-238).

Light Water Reactor A nuclear reactor which uses ordinary water as both coolant and moderator.

Loss of Coolant Accident (LOCA) An accident resulting from a failure in the normal reactor cooling water system (primary coolant system) leading to a loss of the cooling water from the system.

Megawatts Thermal - Mw(t) The amount of power in the form of heat produced by a reactor, measured in millions of watts.

Meltdown See 'Core Melt'.

Noble Gases The elements helium, neon, argon, krypton, xenon, radon. They are all chemically inactive.

Non-volatiles See 'Volatiles'.

NPW Nuclear Powered Warship.

Nuclear Weapons Capable Warship A vessel equipped with the means to carry nuclear weapons. In a narrower sense, the term is also used to refer to vessels equipped to use nuclear weapons, thereby excluding replenishment and transport vessels.

Nuclear Weapons Certified Warship A US nuclear weapons capable warship that has been fitted with extra safety devices required in relation to nuclear weapons and has undergone the necessary inspection, and whose crew have met the selection, training and inspection standards required in order to be permitted to handle nuclear weapons.

Nuclide A particular kind of atomic nucleus characterised by the number of protons and neutrons and, in some cases, by the energy state of the nucleus; e.g. U-235 and U-238 are nuclides contained in natural uranium.

One-Point Detonation The detonation at one point of the high explosive which surrounds the nuclear material in a nuclear weapon and acts as a trigger.

One-Point Safe A US design standard under which there must be less than 1 : 1,000,000 chance of a nuclear weapon producing a nuclear fission yield of more than 4 lbs (1.81 kg) TNT equivalent energy release following a one-point detonation.

OPSMAN 1 The short title of the Australian Department of Defence's manual of procedures governing visits by nuclear powered warships to Australian ports.

Plume The trail of airborne contamination from a radiation accident, fire, etc.

Power Excursion Very rapid increase of reactor power above the normal operating level.

Pressure Vessel In water-cooled reactors, the reactor vessel is designed for a substantial operating pressure; the vessel is therefore often called a pressure vessel.

Primary Circuit The main circuit of the reactor through which coolant passes so as to remove heat from the core.

Pressurised Water Reactor (PWR) A reactor using water under pressure as a coolant and moderator.

Rad The traditional unit for measuring the energy that is deposited by radiation in any material (ie. the absorbed dose), now being replaced by the Gray. (see table following this Glossary)

Radiation Neutrons, alpha or beta particles or gamma rays which radiate out from radioactive substances.

Radioactive Decay The decrease in activity of a radioactive material as it transforms spontaneously from one nuclide into another or into a different energy state of the same nuclide.

Radioactivity The property, possessed by some atoms, of disintegrating spontaneously with the emission of radiation in the form of alpha or beta particles, gamma rays, or neutrons. See the table following this Glossary for the units used in measuring radiation.

Radionuclide A synonym for radioactive nuclide.

Reactor Core The part of a nuclear reactor in which a chain reaction takes place; the reactor core contains the fuel elements, moderator and support structures, and the coolant passes through it.

Rem The traditional unit for measuring the biological effectiveness of a dose of radiation (ie. the dose equivalent), now being replaced by the sievert. (see table following this Glossary)

Risk The combination (usually expressed as the product) of the probability of occurrence of an accident and the magnitude of the consequences of the occurrence.

Runaway An increase in power or reactivity that cannot be controlled by the normal reactor control system.

Safing As applied to weapons, the changing from a state of readiness for initiation to a safe condition.

Scram Of a reactor, its rapid shutdown (to prevent or minimise a dangerous condition) which is initiated when some operational parameter reaches a level determined by operational or safety requirements.

Secondary Circuit The system to which heat is transferred from the primary system.

Sievert The unit in the international system of measurements for measuring the biological effectiveness of a dose of radiation (ie. the dose equivalent). (see table following this Glossary)

Source Term A quantitative description of the release of radioactive material in a nuclear accident. The description includes the physical and chemical form of the nuclides released.

Stable Iodine Iodine that is not radioactive. Iodine taken in this form will block for a time the uptake by the human thyroid gland of any radioactive iodine that may be inhaled or ingested.

Standard Statement A statement issued by the United States Government containing assurances regarding the safety and operation of its nuclear powered warships during visits to other countries. The United Kingdom Government has given assurances in virtually identical terms in relation to its nuclear powered warships.

Steam Explosion A phenomenon in which molten nuclear fuel rapidly fragments and transfers its energy to the reactor coolant resulting in steam generation, shock waves and possible mechanical damage.

SUBROC Rocket with 40-55 km range launched from a submarine which, after flight, re-enters the water to strike against other submarines. There is no version of SUBROC with a conventional warhead.

Theatre Nuclear Weapons A category of weapons of relatively short range that excludes ballistic missiles, which are classed as strategic or intercontinental weapons. Ballistic missiles are not carried on the types of warships that visit Australia.

Thyroid In humans, a small gland weighing about 20 grams situated in the lower front part of the neck. The gland concentrates and stores iodine taken into the body.

Transient A condition of the nuclear plant in which parameters are varying, usually sharply, either because of planned operations, such as load changes, or because an unplanned departure from the specified function of a system or component has occurred.

Volatiles Substances that evaporate easily or rapidly and hence, in the reactor accident context, are more readily dispersed than less volatile substances.

VSP(N) Visiting Ships Panel (Nuclear) - an interdepartmental committee, chaired by a representative of the Australian Department of Defence, which since its formation in 1972 has dealt with safety and other issues relating to visits by nuclear powered warships to Australia. Since February 1988, the VSP(N) has also had responsibilities relating to visits by nuclear weapons capable warships.

UNITS USED IN RADIATION MEASUREMENT

Units are needed to measure a number of different characteristics of radiation. In addition, two separate systems of measurement are used, the International System of units (in French, Le Système International d'Unités from which comes the standard abbreviation, SI units), and the non-SI units. The former are gradually replacing the latter.

Physical Quantity	SI Unit	Non-SI Unit	Relationship
Activity	becquerel (Bq)	curie (Ci)	1Ci = 3.7 X 10^{10}Bq
Exposure (x rays and gamma rays only)	coulomb/kilogram (C/kg)	roentgen (R)	1 R = 2.58 X 10^{-4} C/kg
Absorbed dose	gray (Gy)	rad	1 rad = 0.01 Gy
Dose equivalent	sievert (Sv)	rem	1 rem = 0.01 Sv